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ANNUAL REPORTS

OF THE

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FOR THE

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REPORT OF THE

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REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

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UNITED STATES ARMY.

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REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

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4. Ice Harbor at Marcushook, Pennsylvania.
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6. Delaware Breakwater, Delaware.
7. Construction of harbor of refuge, Delaware Bay, Delaware.
8. Rancocas River, New Jersey.
9. Alloway Creek, New Jersey.
10. Dennis Creek, New Jersey.
11. Cooper Creek, New Jersey.
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13. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

14. Barnegat Bay, New Jersey.
15. Tuckerton Creek, New Jersey.
16. Wading River, New Jersey.
17. Beach Thoroughfare, New Jersey.
18. Oldmans Creek, New Jersey.
19. Dividing Creek, New Jersey.

SURVEY.

20. Salem River, New Jersey.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., July 19, 1897.

GENERAL: I have the honor to transmit herewith the annual reports for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1897.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

G 1.

IMPROVEMENT OF DELAWARE RIVER, NEW JERSEY AND PENNSYLVANIA.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 877.

Expenditures during the past fiscal year have been applied to the following operations:

1. Examinations at Perriwig Bar, Kinkora Bar, Five Mile Bar, Mifflin Bar, Schooner Ledge, and Bulkhead Bar, and simultaneous tidal observations.
2. Improvement and survey of Cherry Island Flats.
3. Improvement and survey of Dan Baker Shoal and Duck Creek Flats.
4. Rebuilding and enlarging the dike on Government reservation at the junction of the Delaware and Schuylkill rivers at Fort Mifflin.

These operations will be described in the above order. The localities referred to, and previous operations thereat, are described in the Annual Report of the Chief of Engineers for 1896, pages 880–885.

1.—EXAMINATIONS AND TIDAL OBSERVATIONS.

Perriwig Bar.—A recent examination shows that the channel through this bar has a depth of 6 feet at mean low water and a width of from 75 to 200 feet. The sum of $5,000 was appropriated for the improvement of this channel in the river and harbor act of June 3, 1896. These funds have been withheld from expenditure, as the channel had not shoaled sufficiently to be an inconvenience to navigation. As there is now evidence of shoaling, it is proposed to widen the channel to 200 feet over its entire length.

Kinkora Bar.—A recent examination shows that the channel through this bar has a minimum depth of 8½ feet at mean low water.

Five Mile Bar.—A recent examination shows that the channel through this bar has a depth of 25 feet at mean low water over its entire width.

Mifflin Bar.—A recent examination shows that the channel through this bar has a minimum depth of 23.4 feet at mean low water.

Schooner Ledge.—A recent examination shows that the channel over this ledge has a minimum depth of 24 feet at mean low water.

Bulkhead Bar.—A recent examination shows that the channel through this bar has a minimum depth of 26½ feet at mean low water.

Tidal observations.—On August 13 and 15, 1896, simultaneous tidal observations were made at twenty-seven stations between the Delaware Breakwater and Trenton in order to determine the instantaneous tidal curves of the bay and river. The cross sections of the river at the tidal stations were carefully measured.

2.—IMPROVEMENT AND SURVEY OF CHERRY ISLAND FLATS.

During the past fiscal year a hydrographic survey of this part of the river, extending from Oldmans Point to the mouth of the Christiana River, was made for the purpose of comparison with previous surveys with a view to determining the changes in progress and the effects of improvements.

Under date of September 23, 1896, contract was entered into with the Morris & Cumings Dredging Company of New York for dredging the channel on the west side of the flats to a depth of 26 feet at mean

low water. Work under this contract was commenced on October 31, 1896, and continued to December 20, 1896, when the dredge was run into and sunk by a steamer. Operations were resumed on April 29, 1897, and are still in progress. During the past fiscal year, 169,235 cubic yards of material, scow measurement, were removed under this contract.

3.—IMPROVEMENT AND SURVEY OF DAN BAKER SHOAL AND DUCK CREEK FLATS.

During the past fiscal year the survey of Duck Creek Flats was completed.

A Board of Officers of the Corps of Engineers was constituted by Special Orders No. 19, Headquarters Corps of Engineers, United States Army, dated July 28, 1896, to consider and report on the project for the dike between Reedy Island and Listons Point, in accordance with the provisions of the river and harbor act of June 3, 1896. The full report of the Board, dated December 7, 1896, is appended hereto.

The recommendations of the Board having been approved by the Secretary of War on December 30, 1896, the adopted project for the improvement of the river was thereby modified so as to provide for the enlargement of the channel from deep water at the head of the bay to deep water above Dan Baker Shoal by dredging instead of by the action of dikes.

Under date of July 31, 1896, the contract of the Delaware Construction Company, of Wilmington, Del., dated November 11, 1895, for the construction and repair of dikes at Reedy Island and Listons Point, was annulled by authority of the Secretary of War, and the resulting loss of the contractors was adjusted on August 17, 1896, by the payment to them of the sum of $54,350.35, in accordance with the provisions of the river and harbor act of June 3, 1896.

Under date of February 26, 1897, contract was entered into with the Morris & Cumings Dredging Company, of New York, for dredging a channel with a least depth of 26 feet at mean low water and a least width of 600 feet, from deep water at the head of the bay to deep water above Dan Baker Shoal, the quantity of material to be removed during the current season being about 3,000,000 cubic yards, scow measurement. Work under this contract was commenced on April 2, 1897, and is still in progress. At the end of the fiscal year 756,316 cubic yards, scow measurement, had been removed. Under date of June 18, 1897, this contract was modified, by authority of the Chief of Engineers, dated June 4, 1897, so as to provide for the formation of a channel 600 feet wide and 26 feet deep at mean low water from deep water above Dan Baker Shoal to deep water below Pea Patch Island, by the removal of about 300,000 cubic yards of material, scow measurement, the work to be done at the same price and completed on or before June 30, 1898.

4.—REBUILDING AND ENLARGING DIKE AT FORT MIFFLIN.

The river and harbor act of June 3, 1896, required the expenditure of $3,000 from the appropriation for improving Delaware River upon this work.

Under date of October 7, 1896, contract was entered into with James J. Cowgill, of Paulsboro, N. J., for the required reconstruction and extension. Work under this contract was completed in December,

1896. The dike on the northeastern side of the reservation, extending from high ground at the old Lazaretto for a distance of 1,800 feet along the Schuylkill River front and an additional distance of 300 feet along the Delaware River front, was rebuilt and repaired. The top is now 10 feet above mean low water and has a width of 12 feet. The interior face has a slope of 1 on 2, and the stone revetment on the exterior slope has been relaid and raised to the full height of the dike.

A balance of $571.60 remains unexpended. It will be applied to further repairs when necessary.

During the past fiscal year, under authorities granted by the Secretary of War, the city of Philadelphia has removed 86,625 cubic yards of rock and other material from Schooner Ledge, and entered into contracts for the extensive improvement of the channel at this locality and at Greenwich Point and Mifflin Bar.

In view of the large amount of work provided for by the city of Philadelphia, and the low prices obtained for dredging in recent contracts, the cost of completing this improvement in accordance with the approved project, in addition to funds now available, is estimated at $300,000 instead of $805,000, as estimated in the Annual Report of 1896.

The Delaware River is tributary to the following collection districts: Trenton, Philadelphia, Wilmington, and Bridgeton.

The amount of revenue collected in these districts during the year ending December 31, 1896, was $12,667,963.42.

Money statement.

July 1, 1896, balance unexpended		$645,607.77
June 30, 1897, amount expended during fiscal year		137,517.54
July 1, 1897, balance unexpended		508,090.23
July 1, 1897, outstanding liabilities	$18,281.31	
July 1, 1897, amount covered by uncompleted contracts	245,998.59	
		264,279.90
July 1, 1897, balance available		243,810.33
Amount (estimated) required for completion of existing project		300,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		300,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

APPROPRIATIONS.

Act of—		Act of—	
July 4, 1836	$15,000	August 2, 1882	$286,000
June 10, 1872	10,000	July 5, 1884	200,000
March 3, 1873	115,000	August 5, 1886	210,000
June 23, 1874	60,000	August 11, 1888	250,000
March 3, 1875	30,000	September 19, 1890	240,000
August 14, 1876	40,000	July 13, 1892	50,000
June 18, 1878	110,000	August 17, 1894	170,000
March 3, 1879	201,000	June 3, 1896	500,000
June 14, 1880	235,090		
March 3, 1881	250,000	Total	2,972,000
Total amount appropriated on present project to June 30, 1897			1,620,000

EXPENDITURES.

Total to June 30, 1897	$2,463,909.77
Total on present project to June 30, 1897	1,111,909.77

Abstract of proposals for dredging in the channel through Cherry Island Flats, Delaware River, opened September 14, 1896, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 400,000 cubic yards.]

No.	Name and address of bidder.	Per cubic yard.	Amount.
		Cents.	
1	American Dredging Co., Philadelphia, Pa	8 4/10	$33,600
2	Virginia Dredging Co., Richmond, Va	11 8/10	47,600
3	Sanford & Brooks, Baltimore, Md	10½	42,000
4	Morris & Cumings Dredging Co., New York, N. Y	7 9/10	31,600

Contract (dated September 23, 1896) entered into with the Morris & Cumings Dredging Company. In progress.

Abstract of proposals for dredging in the channel of the Delaware River through Dan Baker Shoal and Duck Creek Flats, opened February 17, 1897, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 3,000,000 cubic yards.]

No.	Name and address of bidder.	Per cubic yard	Amount.
		Cents.	
1	Morris & Cumings Dredging Co., New York, N. Y	8 9/11	$264,545.45
2	Baltimore Dredging Co., Baltimore, Md	10½	315,000.00
3	Atlas Dredging Co., Wilmington, Del	11	330,000.00
4	American Dredging Co., Philadelphia, Pa	9 2/10	276,000.00

Contract (dated February 26, 1897) entered into with the Morris & Cumings Dredging Company. In progress.

LIST OF ALL CONTRACTS IN FORCE, WITH NAMES OF CONTRACTORS, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

1. With Morris & Cumings Dredging Company, of New York, for dredging in channel of river through Cherry Island Flats, dated September 23, 1896, and approved October 15, 1896. Work to be commenced April 1, 1897, and completed on or before September 30, 1897. Supplemental articles of agreement, changing dumping ground for dredged material, entered into April 2, 1897, and approved by Chief of Engineers, United States Army, April 10, and by Secretary of War April 20, 1897.

2. With Morris & Cumings Dredging Company, of New York, for dredging in channel of river through Dan Baker Shoal and Duck Creek Flats, dated February 26, 1897, and approved March 22, 1897. Work to be commenced on or before April 1, 1897, and be completed on or before December 31, 1897. Supplemental articles of agreement, increasing quantity of material to be dredged, entered into June 18, 1897, and approved by Chief of Engineers, United States Army, June 26, and by Secretary of War July 7, 1897. The additional work to be completed on or before June 30, 1897.

COMMERCIAL STATISTICS.

The following statement concerning the foreign commerce of the Delaware River, for the years ending December 31, 1895 and 1896, are compiled from reports of the Board of Trade, the Commercial Exchange, and the Maritime Exchange, of the city of Philadelphia:

Articles.	1895.	1896.
IMPORTS.	*Tons.*	*Tons.*
Asphalt and asphalt blocks	13,527	10,361
Burlap	8,281	9,771
Cement	56,606	43,071
Chalk	30,696	29,800
Clay	12,398	15,426

Foreign commerce of Delaware River for calendar years 1895 and 1896—Continued.

Articles.	1895.	1896.
IMPORTS—continued.	*Tons.*	*Tons.*
Coal	225	5,658
Coal tar, and pitch of	1,600	817
Cork wood	688	438
Cotton and cotton fabrics	2,444	2,032
Drugs and chemicals	86,370	71,831
Earthenware, china, and stoneware	251	222
Fertilizers	10,878	4,977
Fruits	29,023	13,283
Glass, and manufactures of	913	989
Glue and glue stock	313	416
Groceries and provisions	5,526	6,067
Hair, and manufactures of	681	505
Hemp, jute, flax, and their fabrics	25,330	21,310
Hides and skins	7,045	8,452
Iron, manufactures of	10,471	5,560
Iron ore	312,207	308,217
Iron, pig	6,364	5,521
Iron, scrap	864	699
Lead	5,083	.....
Leather, and manufactures of	268	174
Live stock and fowls	23	40
Mineral water	481	579
Oil	1,918	1,546
Ores, metals, and manufactures of	70,881	17,534
Plants and seeds	7,946	1,739
Plaster of paris	16,821	25,974
Rags	1,146	946
Salt	18,217	20,929
Silk, and manufactures of	116	92
Stone, and manufactures of	4,008	5,031
Sugar	411,151	395,774
Molasses	57,915	2,612
Sulphur, crude	10,784	7,685
Sulphur, ore	43,687	52,944
Tin	29,141	13,972
Tobacco	821	375
Wines and liquors	1,334	1,209
Wood pulp, paper, and manufactures of	25,014	23,916
Wood, and manufactures of	6,617	5,722
Wool and wool fabrics	17,012	8,861
Miscellaneous	2,362	3,643
Total	1,355,456	1,151,722
EXPORTS.		
Beef, pork, and products	23,897	33,217
Cars and locomotives	2,014	6,265
Coal	434,723	338,250
Corn and corn meal	92,682	247,445
Cotton and cotton fabrics	12,089	3,199
Drugs and chemicals	3,516	2,271
Fertilizer	1,454	646
Flour	95,731	91,837
Glucose	9,782	4,014
Glue and glue stock	64	26
Groceries and provisions	2,781	4,958
Hay	571	134
Hides, leather, and manufactures of	858	1,350
Iron, and manufactures of	2,524	4,989
Live stock	5,977	7,030
Metals, other, and manufactures of	216	251
Molasses	21,248	7,956
Oats and oatmeal	3,413	8,142
Oil cake	14,476	39,440
Oils, lubricating	46,421	37,503
Oils, other	452	282
Paraffin	7,508	9,236
Petroleum, crude and refined	873,850	842,697
Seeds	409	172
Soap, tallow, and grease	3,067	4,259
Tobacco	10,903	7,417
Wheat	46,117	145,916
Wines and liquors	2	39
Wood, and manufactures of	19,068	18,339
Miscellaneous	3,100	7,801
Total	1,738,913	1,875,081

Passengers arriving from and departing for foreign countries.

	1895.	1896.
Arriving	30,886	21,920
Departing	11,306	7,811
Total	41,172	29,731

Comparative statement of tons and values of exports, imports, and revenue collected.

Year.	Exports.		Imports.		Revenue.
	Tons.	Value.	Tons.	Value.	
1890	1,502,771	$36,462,951	1,424,102	$56,057,011	$27,572,351
1891	1,540,966	42,845,724	1,381,870	62,438,219	11,121,320
1892	2,359,155	60,274,024	1,429,636	63,277,781	10,886,475
1893	1,816,297	43,416,955	1,154,814	58,870,186	9,899,284
1894	1,801,578	37,441,000	1,164,572	51,553,704	8,456,183
1895	1,738,913	36,745,119	1,355,456	47,271,435	13,526,966
1896	1,875,081	42,431,100	1,151,722	39,807,278	12,657,803

Foreign entrances and clearances.

Class.	Entered from foreign ports.				Cleared for foreign ports.				Total.	
	With cargoes.		In ballast.		With cargoes.		In ballast.			
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
American steam vessels	38	74,191	1	2,512	33	77,405	6	3,372	78	157,480
American sail vessels	118	59,568	6	10,496	144	84,778	1	850	269	155,692
Foreign steam vessels	480	742,239	181	338,934	482	859,082	108	83,604	1,251	2,023,889
Foreign sail vessels	80	74,555	39	46,674	109	112,818	5	3,001	233	237,048
Total	716	950,553	227	398,616	768	1,134,083	120	90,857	1,831	2,574,109

The following statement concerning the domestic and coastwise commerce of the Delaware River for the years ending December 31, 1895 and 1896, has been compiled from returns made to this office by shippers, consignees, and carriers:

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
ARRIVING.				
Brick and terra cotta	60,352	$186,129	50,705	$174,900
Cement and plaster	17,218	128,393	36,261	181,229
Chemicals	118,122	2,237,342	78,121	1,313,962
Coal	1,086,388	3,396,394	1,183,694	4,117,418
Cotton	7,333	1,170,340	8,245	1,317,300
Fertilizers	51,515	724,137	64,983	927,749
Grain	35,439	639,684	19,920	457,207
Hay	8,340	53,814	6,261	53,161
Ice	294,538	564,076	368,894	729,496
Iron:				
Manufactured	108,755	2,500,185	74,126	2,204,211
Pig	169,517	1,881,828	174,069	1,946,963
Scrap	1,307	25,180	1,145	23,969
Lumber	901,117	6,341,822	538,715	3,501,345
Oysters and fish	55,116	1,642,385	24,125	670,380
Petroleum and products	126,339	2,382,919	144,866	2,411,718
Produce and fruit	158,383	1,753,325	138,601	1,395,134
Railroad ties	194,520	996,036	94,431	452,158
Sand	1,099,962	645,633	940,227	763,007
Stone:				
Building	94,937	628,797	99,217	305,861
Paving	137,226	514,087	37,904	109,036
Sugar	4,206	253,360	170	10,630
Wood, cord	22,604	109,784	107,314	418,281
Miscellaneous	1,439,926	158,170,164	1,356,015	239,633,125
Total	6,193,160	186,945,814	5,548,009	263,068,240

Domestic and coastwise commerce of the Delaware River, etc.—Continued.

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
DEPARTING.				
Brick	24,339	$95,816	22,953	$104,704
Chemicals	26,645	2,821,048	22,927	1,640,126
Coal	5,873,218	20,328,973	4,890,790	17,196,019
Cotton	9,855	1,396,740	7,339	1,059,780
Fertilizer	68,456	1,145,348	68,247	1,485,653
Grain	5,945	352,532	3,450	66,992
Hay			355	3,375
Ice	1,354	3,562	500	1,000
Iron:				
Manufactured	146,163	4,855,301	142,699	4,230,789
Pig	74,802	826,550	37,782	415,602
Scrap	3,425	37,370		
Lumber	70,523	787,600	31,894	371,926
Manure	175,302	334,683	157,157	239,029
Petroleum	81,547	2,725,966	139,804	2,047,332
Produce	376	33,055	6,175	225,405
Sand	105,613	135,156	13,592	16,590
Stone, building	2,297	11,518	826	5,410
Sugar	11,324	710,160	3,394	271,520
Miscellaneous	1,448,002	172,782,910	1,144,169	249,208,623
Total	8,129,186	209,384,288	6,693,553	278,589,875

Passengers arriving at and departing from Philadelphia.

	1895.	1896.
Arriving	1,388,840	1,202,324
Departing	1,412,761	1,207,239
Total	2,801,601	2,409,563

Domestic and coastwise arrivals and departures in cargo.

Class.	1895.		1896.	
	Arrivals.	Departures.	Arrivals.	Departures.
Steamers	*a* 16,536	*a* 16,155	*a* 15,838	*a* 20,243
Sailing vessels	7,953	5,763	5,549	5,885
Canal boats and barges	20,186	22,009	*b* 17,980	*c* 21,136
Rafts	282	63	25	93
Total	44,957	43,990	39,392	47,357

a Excluding tugboats and ferryboats.
b Including 2,778 railroad lighters between Philadelphia and Camden.
c Including 2,908 railroad lighters between Philadelphia and Camden.

SUMMARY.

Freight movement.

	1895.		1896.	
	Tons.	Value.	Tons.	Value.
Foreign:				
Arriving	1,355,456	$47,271,435	1,151,722	$39,807,278
Departing	1,738,913	36,745,119	1,875,081	42,431,100
Domestic:				
Arriving	6,193,160	186,945,814	5,548,009	263,068,240
Departing	8,129,186	209,384,288	6,693,553	278,589,875
Total	17,416,715	480,346,656	15,268,365	623,896,493

Vessel movement.

	1895.	1896.
Steam vessels, foreign trade, arriving	764	700
Sailing vessels, foreign trade, arriving	391	243
Steam vessels, foreign trade, departing	637	629
Sailing vessels, foreign trade, departing	377	259
Steam vessels, domestic trade, arriving	16,536	15,838
Sailing vessels, domestic trade, arriving	7,953	5,549
Canal boats and barges, domestic trade, arriving	20,186	17,980
Rafts, domestic trade, arriving	282	25
Steam vessels, domestic trade, departing	16,155	20,243
Sailing vessels, domestic trade, departing	5,763	5,885
Canal boats and barges, domestic trade, departing	22,009	21,136
Rafts, domestic trade, departing	63	93
Total	91,116	88,580

REPORT OF THE BOARD OF ENGINEERS APPOINTED TO CONSIDER AND REPORT ON THE PROJECT FOR THE DIKE BETWEEN REEDY ISLAND AND LISTON POINT, DELAWARE RIVER, IN ACCORDANCE WITH THE PROVISIONS OF THE RIVER AND HARBOR ACT OF JUNE 3, 1896.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., December 7, 1896.

SIR: The Board of Officers of the Corps of Engineers, constituted by Special Orders, No. 19, Headquarters Corps of Engineers, United States Army, dated July 28, 1896, to consider and report on the project for the dike between Reedy Island and Listons Point, Delaware River, in accordance with the provisions of the river and harbor act of June 3, 1896, has the honor to submit the following report:

The Board met at the United States Engineer Office in Philadelphia, Pa., on August 10, October 16, and November 30, 1896. On October 16, 1896, the Board gave a public hearing at the rooms of the oard of trade in Wilmington Del., at which a full expression of the views of all persons interested in the subject under consideration was invited. The hearing was previously advertised in the newspapers in Philadelphia, Wilmington, and Smyrna. A full stenographic report* of this hearing is transmitted herewith. On October 17, 1896, the Board proceeded to Listons Point and Reedy Island and personally examined the Delaware River in that vicinity. At the final meeting, held on November 30, 1896, this report was unanimously adopted.

The provisions of the act of June 3, 1896, relating to the improvement of this locality, are included in the item appropriating $500,000 for improving Delaware River, from Trenton to its mouth, Pennsylvania and New Jersey, and are as follows:

Provided, That so much of said sum of five hundred thousand dollars as shall be necessary may, in the discretion of the Secretary of War, be expended in dredging a channel through Dan Baker Shoal to the depth of twenty-six feet at low water: *And provided further*, That no part of said appropriation or of any appropriations heretofore made shall be expended upon the building of a dike between Reedy Island and Listons Point until a board of three engineer officers, to be appointed by the Secretary of War, shall consider and report to the Secretary of War on the first Monday in December of the current year as to the project of said dike with reference to preserving and improving the navigation of the Appoquinimink River and Blackbird Creek, and the riparian rights and facilities of the Delaware shore, as well as to deepening the main channel of said river. And the Secretary of War is hereby authorized to carry out the recommendations of said board; * * * also to expend

* Not printed.

the additional sum of twenty-five thousand dollars in his discretion for such dredging as may be necessary for the maintenance of channels from the mouths of Appoquinimink River and Blackbird Creek to the channel of the Delaware River through the dike now being constructed from Reedy Island to Listons Point for the improvement of the Delaware.

The subjects thus submitted for the consideration of the Board may be conveniently arranged and stated as follows:

1. The adopted project for the Reedy Island and Listons Point dike with reference to the deepening of the main channel of the Delaware River.

2. The project for the dike with reference to preserving and improving the navigation of the Appoquinimink River and Blackbird Creek and the riparian rights and facilities of the Delaware shore.

3. The desirability of dredging a channel through Dan Baker Shoal, either as a substitute for improvement by dike construction or in conjunction therewith.

4. The desirability of dredging the channels from the mouths of Appoquinimink River and Blackbird Creek to the channel of the Delaware River through the Reedy Island and Listons Point dike.

It is proposed to consider these subjects separately and in the order above stated.

1.—THE ADOPTED PROJECT FOR THE REEDY ISLAND AND LISTONS POINT DIKE WITH REFERENCE TO THE DEEPENING OF THE MAIN CHANNEL OF THE DELAWARE RIVER.

The project for this dike forms a part of the plan for the permanent improvement of the Delaware River proposed by a Board of Engineers in its report dated January 23, 1885. This report is printed in the Annual Report of the Chief of Engineers for 1885, part 1, the part relating to this dike, commencing on page 828, being as follows:

Reedy Island Flats, or Dan Bakers Shoal.—Opposite and above Listons Point, extending to Stony Point, there is a nearly midriver channel way 3½ miles long and 2,500 feet wide with a full depth of 27 feet at mean low water. Above this the river suddenly expands to a width of 19,400 feet, in which the depth is reduced to 20 feet in a channel 5,000 feet wide. To keep the flood tide away from the deep concavity on the right bank and to force it to use conjointly with the ebb tide the channel on the east side of Reedy Island, a longitudinal dike is proposed which will extend from the lower end of Reedy Island to a point on the right bank below Blackbird Creek. This dike is designed to follow the 13-foot curve of the right bank, to be about 25,000 feet long, and to have such a direction as will gently train the currents along the channel where an increased depth is demanded. The reduced width between banks will be 16,000 feet, and the reduced sectional area 400,000 square feet. The dike will be similar in construction to the one proposed further on on Bombay Hook Shoals. It is estimated to cost $324,000.

It may be necessary some time in the future, after the completion of this dike, to supplement the improvement by the construction of a work on the left bank. The character and position of such a work are left for the study of the local engineer. No dredging is contemplated, as it is expected that the improvements will produce sufficient scour to gain gradually the desired increase of depth.

The dike proposed on Bombay Hook Shoals, to which the dike under consideration was to be similar in construction, was to "consist of a mattress foundation covered with stone, which will rise to the level of mean low water, possibly a little higher."

These two dikes, about 5 miles long each, are both on the Delaware side of the channel, and, though separated by a short reach of deep water, should be treated as a single improvement. This Board is of opinion that to be effective they would have to be built to a little above high water.

During the twelve years which have elapsed since the report of the

Board of 1885 was submitted the channel of the Delaware River has been closely watched and carefully investigated and much valuable information has been obtained. The result of these studies is to confirm the wisdom of the location of the Reedy Island dike as established by the Board of 1885. But recent investigations show that there is at various localities in the channel considerable material of a compact character which can not be removed by the action of the currents alone, however concentrated, and must therefore be removed by dredging.

The dike would, of course, be most effective in its action upon the channel if the space between Listons Point and Reedy Island were entirely closed. If large openings are left in the dike, as seems necessary to facilitate local navigation, its efficiency must be thereby diminished.

If the dike were thus constructed to above high water, with sufficient openings for local navigation, the Board is of the opinion that it would assist in the maintenance of the deep-water channel, but it does not believe that a channel of the dimensions desired would be created by the action of the dike alone.

2.—THE PROJECT FOR THE DIKE WITH REFERENCE TO PRESERVING AND IMPROVING THE NAVIGATION OF THE APPOQUINIMINK RIVER AND BLACKBIRD CREEK AND THE RIPARIAN RIGHTS AND FACILITIES OF THE DELAWARE SHORE.

Blackbird Creek enters the Delaware River on its western shore about 2½ miles above Listons Point. It has a depth of about 3½ feet at mean low water at the mouth. Appoquinimink River enters the Delaware River on the same shore about three-fourths of a mile above Blackbird Creek. It has a depth of about 7 feet at mean low water at the mouth. These streams are navigated by vessels of light draft engaged in local commerce. West of Reedy Island is the village of Port Penn, and the length of the Delaware shore from this village to Listons Point is about 8 miles. Within the area inclosed between this part of the Delaware shore, the location of the proposed dike, and Reedy Island, except a comparatively small area immediately behind the island, the average depth at mean low water is about 6 feet. Any artificial obstruction to free access from the main channel of the Delaware River to the Delaware shore (such as a longitudinal dike) must necessarily interfere with the "riparian rights and facilities of the Delaware shore."

In the opinion of the Board, the proposed dike, however it may be located or constructed, can not have any beneficial effect in preserving or improving the navigation of the Appoquinimink River and Blackbird Creek. But it is evident that, however built, it must to some extent encroach upon the riparian rights and facilities of the Delaware shore, since it will be an obstacle to free approach from some directions. If several large openings are left in the work to facilitate interior navigation, as proposed by the engineer officer in local charge, the obstruction will not be serious; but the beneficial effect of the dike upon the channel of the Delaware River will be correspondingly diminished.

3.—THE DESIRABILITY OF DREDGING A CHANNEL THROUGH DAN BAKER SHOAL, EITHER AS A SUBSTITUTE FOR IMPROVEMENT BY DIKE CONSTRUCTION OR IN CONJUNCTION THEREWITH.

As has been already remarked, the material in some parts of the channel is of such compact character that dredging will be necessary to obtain the increased depth required. If the shore is to be rectified

by the establishment of a dike, the Board is of the opinion that the construction of the dike should be carried well toward completion before any dredging is executed. The objects of this method of procedure are to save the cost of dredging such material as the dike would remove and secure the assistance of the dike in the maintenance of the increased depth.

The question whether, under existing circumstances, improvement by dredging alone may not be advantageously substituted for improvement by dike construction has received the careful consideration of the Board.

A comparison of detailed surveys completed during the current year with the survey made by the United States Coast and Geodetic Survey fourteen years ago appears to indicate that remarkable changes have been in progress in this part of the river during the past fourteen years. The channel has decidedly deepened, the deeper parts having generally approached each other. The amount of material that has disappeared from the channel between the 18-foot curves from Reedy Island to deep water below Bombay Hook is estimated at about 12,000,000 cubic yards, place measurement. At least 13,000,000 cubic yards have disappeared from the bed of the river between Reedy Island and Listons Point during the same interval, a change which is most remarkable since the excess of shoaling over deepening in this reach between 1841 and 1881 was found after careful investigation by the Coast Survey in 1884 to be 8,096,150 cubic yards.* The position of the line of deepest water remains practically unchanged.

The cost of dredging has been greatly reduced since the Board of 1885 made its report, being now about one-third of that Board's estimate. On the other hand, raising the dike from low water to high water largely increases its cost. At the same time the leaving of sufficient openings in the dike to accommodate the riparian interests, which appears necessary, largely diminishes the effectiveness of the dike. Under these circumstances the question arises whether it would not be best to abandon all attempts to improve this part of the river by dike construction and dredge a channel from deep water at the head of the bay to deep water above Dan Baker Shoal.

The existing project for the improvement of this reach of the river involves the construction not only of the Reedy Island and Listons Point dike, but also of a dike below Listons Point for the improvement of Bombay Hook Roads. These dikes are, in some places, difficult of construction owing to the character of the bottom. In the opinion of the Board they must be raised to the level of extreme high water to insure effective action. About 6,300 feet of the dike below Reedy Island and about 2,100 feet of the dike above Listons Point have already been constructed to the level of mean low water. These works in their present condition will not injure the river and will be of some small assistance in channel maintenance. If the projected dikes are constructed to the level of extreme high water, the cost will not be less than $1,500,000 in addition to what has already been expended upon them. If the work is to bear the expense of creating and maintaining navigable depths to the mouths of tributary streams, this estimate must be increased.

The dikes will be liable to injury from ice and storms. The Board of 1885 estimated the cost of maintenance at 1 per cent of the cost of construction. Upon this basis the annual cost of maintenance would be at least $16,000.

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*Report of United States Coast and Geodetic Survey, 1884, page 433.

After the dikes are completed it will, in the opinion of the Board, still be necessary to dredge a considerable part of the channel in order to obtain the desired depths, nor is it certain that the dikes will maintain these depths without more or less annual dredging.

To dredge a channel 600 feet in width to a depth of at least 26 feet at mean low water from deep water at the head of the bay to deep water above Dan Baker Shoal would require the removal of about 3,000,000 cubic yards of material, scow measurement, which at 10 cents per cubic yard is estimated to cost $300,000 or $1,200,000 less than the cost of completing the dikes. The Board finds no reason to believe that the cost of maintenance of the dredged channel will be greater than the cost of maintenance of the dikes, if the interest on the additional cost of the plan of improvement by dikes is taken into consideration.

An additional reason for dredging this channel at once, instead of building the dikes, is that the entire channel from deep water above Dan Baker Shoal to deep water in the bay can be completed during the year 1897 with funds now available if dredging is resorted to, while the dikes could not be completed until after the expenditure of about $1,000,000 in addition to funds now available, and then the material not removed by the dikes from the main channel would have to be dredged and also the channels connecting with the Delaware streams behind the dikes, all of which would require several years. The saving to the commerce of the Delaware River by the prompt completion of this improvement, as well as the removing of all causes of complaint by the riparian owners adjacent to the dikes, should not be ignored in considering this question.

For the reasons given the Board is of opinion that it is best to abandon for the present all attempts to improve this part of the river by dike construction, and that a channel at least 600 feet wide with a least depth of 26 feet at mean low water should be dredged from deep water above Dan Baker Shoal to deep water in the bay.

4.—THE DESIRABILITY OF DREDGING THE CHANNELS FROM THE MOUTHS OF APPOQUINIMINK RIVER AND BLACKBIRD CREEK TO THE CHANNEL OF THE DELAWARE RIVER THROUGH THE REEDY ISLAND AND LISTONS POINT DIKE.

If the dikes at Reedy Island and Listons Point are not further extended, it will be neither necessary nor desirable to dredge channels from the mouths of these streams to the channel of the Delaware River. So long as the flood current has free access to the Delaware shore such channels could not be maintained without constant dredging. The Board therefore recommends that no expenditure be made for this purpose. In the opinion of the Board the existing dikes will not impair the navigation of these streams.

RECOMMENDATIONS.

The Board recommends that no further expenditures be made in the construction of dikes for the improvement of the Delaware River below Reedy Island; that a channel with a least depth of 26 feet at mean low water and a least width of 600 feet be formed by dredging from deep water at the head of the bay to deep water above Dan Baker Shoal, as shown on the accompanying map;* that the dredged material be placed

* Not printed.

between Stony Point Shoal and the New Jersey shore below the mouth of Alloway Creek, or deposited in such other places as may be approved by the engineer officer in local charge; that the work of dredging be done within the next working season, and with funds now available; and that no money be expended in dredging channels from the mouths of the Appoquinimink River and Blackbird Creek to the channel of the Delaware River.

The place of deposit recommended by the Board is very convenient to Dan Baker Shoal, and the filling of this area will rather prove a benefit than an injury. The harder material could be placed at the ends and the deposit should not be raised to a higher level than 12 feet below low water. This would not injure the channel of Alloway Creek.

Respectfully submitted.

HENRY M. ROBERT,
Colonel, Corps of Engineers.
PETER C. HAINS,
Colonel, Corps of Engineers.
C. W. RAYMOND,
Major, Corps of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.
(Through the Chief of Engineers, U. S. A.)

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
December 9, 1896.

Respectfully submitted to the Secretary of War.

The river and harbor act of June 3, 1896, in making appropriation for improving Delaware River from Trenton to its mouth, provides as follows:

That no part of said appropriation or of any appropriations heretofore made shall be expended upon the building of a dike between Reedy Island and Listons Point, until a board of three engineer officers, to be appointed by the Secretary of War, shall consider and report to the Secretary of War, on the first Monday in December of the current year, as to the project of said dike with reference to preserving and improving the navigation of the Appoquinimink River and Blackbird Creek and the riparian rights and facilities of the Delaware shore as well as to deepening the main channel of said river. And the Secretary of War is hereby authorized to carry out the recommendations of said board; * * * also to expend the additional sum of twenty-five thousand dollars in his discretion for such dredging as may be necessary for the maintenance of channels from the mouths of the Appoquinimink River and Blackbird Creek to the channel of the Delaware River through the dike now being constructed from Reedy Island to Listons Point for the improvement of the Delaware.

The Board of Engineers constituted under this provision of the act submits the within report, to which attention is respectfully invited.

The Board recommends—

that no further expenditures be made in the construction of dikes for the improvement of the Delaware River below Reedy Island; that a channel with a least depth of 26 feet at mean low water and a least width of 600 feet be formed by dredging from deep water at the head of the bay to deep water above Dan Baker Shoal, as shown on the accompanying map; that the dredged material be placed between Stony Point Shoal and the New Jersey shore below the mouth of Alloway Creek, or deposited in such other places as may be approved by the engineer officer in local charge; that the work of dredging be done within the next working season, and with funds

now available, and that no money be expended in dredging channels from the mouths of Appoquinimink River and Blackbird Creek to the channel of the Delaware River.

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

[Second indorsement.]

WAR DEPARTMENT,
December 30, 1896.

Approved.

DANIEL S. LAMONT,
Secretary of War.

G 2.

IMPROVEMENT OF HARBOR BETWEEN PHILADELPHIA, PENNSYLVANIA, AND CAMDEN, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 897.

During the past fiscal year, under a contract with the American Dredging Company dated June 1, 1893, 3,956,027 cubic yards of material, scow measurement, was excavated from the harbor, and the filling of League Island were completed by the deposit of 594,766 cubic yards of material, scow measurement.

The total amount of work accomplished to June 30, 1897, is as follows:

Material removed by dredging, scow measurement	cubic yards	18, 626, 766
Piling and revetment removed	linear feet	24, 848
Dredged material deposited and spread on League Island, scow measurement	cubic yards	3, 584, 624

By the work already executed the following results have been obtained:

The channel has been dredged to the full depth of 26 feet from Morris street to the Pennsylvania Railroad Bridge at Fishers Point, 6.2 miles. From Morris street to Shackamaxon street, 14,300 feet, the channel has a minimum width of 530 feet, a maximum width of 1,000 feet, and a mean width of 978 feet. The minimum width is at one locality only, dredged in 1894 to permit the laying of telephone and telegraph cables, the depth averaging about 24.4 feet. This elevation has been left temporarily during the execution of dredging above and below, in order not to disturb the cables. It will be removed during the present season.

The next narrowest width is 920 feet, distances being measured from the new Philadelphia pierhead line.

From Shackamaxon street to Pier 3, Richmond wharves, 7,675 feet, the maximum width of channel is 1,000 feet, its minimum width, 120 feet, and its mean width, 695 feet; from Pier 3, Richmond wharves, to Venango street, 6,530 feet, the channel has a maximum width of 1,000 feet, a minimum width of 600 feet, and a mean width of 878 feet; from Venango street to the bridge, 4,240 feet, the maximum width of channel is 1,000 feet, its minimum width 735 feet, and mean width 955 feet.

Smith and Windmill islands have been removed to an average depth of 25 feet at low water; the northern side of Petty Island has been dredged back to the New Jersey pierhead and bulkhead line, giving a low-water width of 1,900 feet to the Pennsylvania channel at that

locality; all the pile and stone revetments have been removed, and the filling of spaces on League Island as provided for in the contract, completed. About 133 acres of land formerly above low water have been removed, and 282 acres formerly below high water have been raised above high water. The data required for the execution of the work, and the determination of its effects and changes have been obtained from detailed daily hydrographic examination and surveys, based on a rigid system of triangles and range lines marked by natural objects covering the entire distance from Fishers Point to Kaighn Point, 6½ miles. Tidal observations are registered by an automatic gauge at Pier 53, south.

Surveys and examinations made during the past fiscal year show that the increased depths have been well maintained, no shoaling having been found within the limits of the improved channel, except along the face of Petty Island and above Erie avenue, where the dredging is not yet completed. The shoal ridge occupied by the telegraph and telephone cables, opposite Market street, has scoured from 3 to 7 feet in depth on the Philadelphia side, accompanied by a recession of the 26-foot contour from the Philadelphia pierhead line amounting to 370 feet in one year. The present area of the shoal is about one-half its former one.

The shoal near Cooper Point, outside the limits of the 26-foot channel 1,000 feet wide along the revised Philadelphia wharf line, due to the conflict of tides at the foot of Petty Island, still remains; no permanent improvement at this point can be expected until the channel south of Petty Island has been closed by the extension of Fishers Point Dike.

During the current fiscal year it is expected that the improvement will be completed with the funds now available.

During the past fiscal year work was commenced on the extension of four piers along the Philadelphia front.

Three piers previously commenced were extended fully to the new line and permission was given by the board of port wardens for the extension of 10 others.

Up to June 30, 1897, 11 wharves between Cumberland street and Queen street on the Philadelphia front have been extended to the new Philadelphia pierhead line, and between Linden and Mickle streets, Camden, 2 wharves have been similarly extended to the New Jersey pierhead line. One wharf is now under construction along the Philadelphia front and heavy material has been dumped as foundations for 4 others.

Detailed information with reference to this subject is given in a letter dated June 28, 1897, from Mr. W. R. Tucker, secretary of the board of trade, which he has kindly prepared at my request. This letter and its accompanying papers are appended hereto.

During the fiscal year, under authority granted by the Secretary of War, dated November 3, 1894, the Pennsylvania and New Jersey Railroad Company has completed, in accordance with the plans approved by the War Department, a bridge crossing the Delaware River at Fishers Point, 4½ miles above Market street, and within the limits of the harbor improvement.

The commercial statistics pertaining to this work are included in the statistics accompanying the report for the improvement of Delaware River.

This work lies in the collection district of Philadelphia, at which, as a port of entry, there was collected during the year ending December 31, 1896, revenue to the amount of $12,657,803.42.

The nearest fort and light-houses are, respectively, Fort Mifflin and Schuylkill River range lights.

Money statement.

July 1, 1896, balance unexpended		$802,192.31
Amount appropriated by sundry civil act approved June 4, 1897		694,000.00
		1,496,192.31
June 30, 1897, amount expended during fiscal year		695,661.08
July 1, 1897, balance unexpended		800,531.23
July 1, 1897, outstanding liabilities	$354,793.33	
July 1, 1897, amount covered by uncompleted contracts	445,737.90	
		800,531.23

APPROPRIATIONS.

Act of—		Act of—	
August 11, 1888	$500,000	March 2, 1895	$850,000
September 19, 1890	200,000	June 11, 1896	600,000
March 3, 1891	300,000	June 4, 1897	694,000
August 5, 1892	41,000		
March 3, 1893	500,000	Total	3,935,000
August 18, 1894	250,000		

Total appropriation under present project to June 30, 1897 ..... $3,635,000

EXPENDITURES.

Total to June 30, 1897		$3,134,468.77
Under present project for dredging and removal of pile and timber revetment	$2,485,861.42	
For depositing and spreading material on League Island	348,607.35	
		2,834,468.77

CONTRACT IN FORCE, WITH NAME OF CONTRACTOR, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

1. With American Dredging Company, of Philadelphia, Pa., dated June 1, 1893, approved by the Chief of Engineers, United States Army, June 5, and by the Secretary of War June 15, 1893, for complete execution of the work of improving the harbor of Philadelphia, to be paid for as appropriations may be made from time to time by law. To be commenced on or before July 1, 1893, and continued as rapidly as may be required to the extent of dredging 400,000 cubic yards in any one calendar month, provided funds are available for payment therefor.

LETTER FROM MR. W. R. TUCKER, SECRETARY OF THE BOARD OF HARBOR COMMISSIONERS FOR THE CITY OF PHILADELPHIA, PA., WITH REFERENCE TO THE PROGRESS OF THE WORK OF RECONSTRUCTION OF THE DELAWARE RIVER WATER FRONT DURING THE FISCAL YEAR ENDING JUNE 30, 1897, WITH THREE INCLOSURES.

BOARD OF HARBOR COMMISSIONERS FOR THE CITY OF PHILADELPHIA,
Philadelphia, Pa., June 28, 1897.

SIR: I beg to acknowledge the receipt of your communication under date of May 19 last, in which you asked to be fully informed as to the progress being made in the reconstruction of the water front along the Delaware River or in preparation therefor. In addition to replying to your inquiry as made, I shall also make my answer cover, as far as possible, all action taken looking to the improvement of the navigation of the Delaware and Schuylkill rivers.

NEGOTIATIONS WITH PROPERTY OWNERS AS TO DAMAGES ARISING FROM WIDENING DELAWARE AVENUE.

Under authority of an ordinance passed March 11, 1895, the mayor of Philadelphia, at the date of my last communication to you on this subject (June 25, 1896), had transmitted to city councils a report embodying a full account of his negotiations, with the amount of damages adjusted. On October 6, 1896, an ordinance was passed by city councils authorizing the payment of certain sums to property owners along the

easterly side of Delaware avenue between Vine street and South street, as an adjustment of the amount of damages on account of the widening of the said avenue, under the agreement effected by the mayor with the majority of the owners of property within the limits named.

MUNICIPAL LEGISLATION FOR READJUSTMENT OF THE HARBOR.

The construction of a bulkhead where necessary, along the Delaware River, between Vine and South streets, and the extension of sewers, laying and relaying of gas and water mains, etc., were authorized by ordinance November 27, 1896. The ordinance also authorized the mayor to enter into an agreement with the board of directors of city trusts "whereby the said board will become liable to pay a sum not exceeding six hundred and fifty thousand (650,000) dollars, for the expense of carrying out the work authorized."

PROPOSED EXPENDITURE OF $500,000 APPROPRIATED BY THE CITY FOR IMPROVEMENT OF THE DELAWARE RIVER.

On June 3, 1897, the American Dredging Company was awarded the contract for dredging in the Delaware River, on the middle ground off Greenwich Piers, on Fort Mifflin Bar between Fort Mifflin and Lincoln Park wharf, and along Schooner Ledge Range, between South Chester and Marcus Hook. On the same date H. T. Dunbar & Co. were awarded a contract to complete the dredging at Schooner Ledge.

I am greatly indebted to Mr. George S. Webster, chief engineer and surveyor of the city, for an account of the work by the city of Philadelphia, upon the improvement of the harbor and the Delaware and Schuylkill rivers, which is being conducted by the department of public works, bureau of surveys, under appropriations made by city councils.

I take great pleasure in inclosing copy of his communication upon this subject, which is marked A.

EXTENSION OF PIERS ALONG THE CITY FRONT.

I inclose with this a letter (marked B) from Mr. George F. Sproule, secretary of the board of port wardens for the port of Philadelphia, giving a list of licenses for the extension of piers from June 30, 1896, to the present date, by which you will note that the riparian owners are availing themselves of the increased wharf and dock facilities made possible by the removal of the islands formerly obstructing the harbor and contemplated when the Philadelphia Board of Trade first urged upon Congress in January, 1887, the wisdom of authorizing the improvement of the harbor now so nearly completed.

STATE LEGISLATION.

On June 14, 1897, the governor signed a bill, amending the laws governing the port wardens, as to width of docks, providing that hereafter "No license shall be granted under which a new wharf is to be built or an old wharf extended in counties coextensive with cities of the first class, unless there shall be after the building or extension of such wharf a dock or water surface between it and the adjoining wharves on each side of at least *one hundred and fifty feet* unless said board of wardens by a vote of a majority of the whole board shall decide that the public convenience demands a variance from this rule in any particular case."

The amendment was suggested and urged by the board of port wardens and strongly indorsed by the board of harbor commissioners which memorialized the governor and legislature, petitioning for its passage. Copy of memorial inclosed, marked C.

WORK OF CONTRACTORS UPON HARBOR IMPROVEMENT.

The anticipated completion, by the American Dredging Company, of the contract for the improvement of Philadelphia Harbor by the close of the present working season will be nearly a year and a half in advance of contract requirements, and will by that interval permit the earlier utilization of the improvement. It is of interest to note in this connection, that the contractors have not permitted the absence of appropriation at any time to interfere with the rapid progress of the work, but on the contrary it has been energetically pushed forward at times during the entire absence of appropriations for the payment of work done.

In view of the satisfactory work done by the American Dredging Company, under its contract with the Government, much satisfaction is expressed at its securing the recent contract from the city for the improvement of the Delaware River.

Truly, yours,

W. R. TUCKER, *Secretary.*

Maj. C. W. RAYMOND, *Corps of Engineers.*

INCLOSURE A.

DEPARTMENT OF PUBLIC WORKS, BUREAU OF SURVEYS,
Philadelphia, Pa., June 14, 1897.

DEAR SIR: Replying to your favor of the 10th instant, requesting a statement as to the condition of the work upon the widening of Delaware avenue and the improvement of the rivers, I report as follows:

Contract No. 1, at Schooner Ledge.

Appropriation December 28, 1894. Contractor, The Philadelphia Public Works Company. Date of contract, December 10, 1895. Limit of contract, $175,000.

The work has consisted of the dredging and removal of overlying materials from Schooner Ledge and Illinois Rocks opposite Chester in the main ship channel. About 95,000 cubic yards of this material was removed, uncovering the rock.

After this had been done, the rock was drilled by hydraulic drills mounted on tramway along top of drill scow operating at high tide in more than 30 feet of water.

The explosive used was dynamite made near the site. After blasting, the rocky material is being removed by powerful dredges.

About 9,000 cubic yards of rock (place measurement) has been removed, about 5,000 cubic yards in addition having been blasted and in course of removal.

Twenty-six feet clear water depth has been obtained, the aim in dredging being to secure 27 feet.

Councils by ordinance of March 22, 1897, extended the contract of this company for rock removal to an additional amount of $125,000 to be taken from the loan authorized by the ordinance of January 31, 1896, in which the sum of $500,000 was set aside for the improvement of the channel of the Delaware River. The work of blasting on Schooner Ledge under this supplemental contract is now in progress.

Contract No. 2.—Dredging in the Schuylkill River between Fifty-eighth street and its month.

This work consists of dredging a channel averaging 250 feet in width and 22 feet in depth between Yankee Point and Penrose Ferry Bridge as far as the money permitted. Authorized December 28, 1894. Contractor, Frank C. Somers, Camden, N. J. Date of contract, October 16, 1895. Amount of contract, $40,000. Work completed September 30, 1896.

The materials removed consisted of mud and gravel, and were deposited beyond high-water mark behind the river banks.

Contract No. 3.—Dredging in the Schuylkill River, between a point about one-half mile above Penrose Ferry Bridge and Fifty-eighth street.

Authorized May 26, 1896. Contractor, Philadelphia Public Works Company. Date of contract, September 7, 1896. Limit of contract, $40,000. Channel width, 250 feet; depth, 22 feet.

The contract requires the material dredged to be placed beyond high-water mark.

No material has yet been removed under this contract. As soon as the plant for pumping the material over the banks has been placed in working order, some progress will probably be made.

Contract No. 4.—Schuylkill River between Fifty-eighth street and Walnut street.

Authorized December 28, 1895. Contractor, Philadelphia Public Works Company. Date of contract, September 7, 1896. Limit of contract, $45,000. Channel width 150 feet, depth 20 feet, to a point 700 feet above Harrison's wharf, 18 feet between this point and Walnut street.

About 3,000 yards of material has been removed and placed above high water.

Contract No. 5.—Remaining rock dredging at Schooner Ledge.

Authorized April 13, 1896. Contractor, H. T. Dunbar & Co. Date of contract, June 3, 1897. Amount of contract, $28,000. The completion of this contract it is expected will clear the channel at Schooner Ledge of rock so as to give the 26 feet depth at low water.

Contract No. 6.—Dredging in the Delaware River from a point near the prolongation of Avenue 38 south to a point near the prolongation of Morris street; on Fort Mifflin Bar, between Fort Mifflin and Lincoln Park wharf; along Schooner Ledge Range, between South Chester and Marcushook.

Authorized April 13, 1896. Contractor, the American Dredging Company. Date of contract June 3, 1897. Amount of contract, $315,000.

As soon as the sureties of contracts Nos. 5 and 6 have been approved by councils, the contractors will be notified to proceed.

WIDENING DELAWARE AVENUE.

The ordinance of October 6, 1896, authorized the settlements of claims for the widening, with owners, to the amount of $616,067.

The plans for the reconstruction and extension of the sewers incident to the widening of the avenue have been completed; also plans for the bulkhead construction.

As soon as these plans have received the approval of the board of directors of city trusts, they will be advertised. This board, by an agreement entered into with the mayor under the ordinances of November 27, 1896, agrees to pay for this bulkhead construction and the extension of sewers a sum not exceeding $650,000, which, with the sum of $1,500,000 set aside by the city, makes the sum of $2,150,000 available.

This includes the construction of four piers—at Dock, Chestnut, Arch, and Race streets—licenses for three of which have been secured. Detailed plans for the construction of the Chestnut Street Pier are ready for advertisement.

Yours, truly,

G. W. WEBSTER, *Chief Engineer.*

Mr. W. R. TUCKER,
Secretary, Board of Harbor Commissioners.

INCLOSURE B.

BOARD OF PORT WARDENS FOR THE PORT OF PHILADELPHIA, PA.,
Philadelphia, June 11, 1897.

DEAR SIR: In reply to your favor of the 10th, asking for the list of licenses for the extension of piers from June 30, 1896, to present time, I beg to submit the following:

The Manor Real Estate and Trust Company and the city of Philadelphia, jointly, to build ferry racks in the Delaware River at the foot of Market street.

The city of Philadelphia, Camden and Philadelphia Steamboat Ferry Company, and Girard estate, jointly, to build ferry racks in the Delaware River at the foot of and north of the north line of Market street.

The Franklin Sugar Refining Company, to extend the bulkhead in front of their property below South street.

The Philadelphia and Reading Railway Company, to extend Pier 8 south to the new wardens' line..

George T. Lewis, to build a pier in front of his property between Moore and Mifflin streets.

The Terminal Land Company, to extend Pier 40 north to the new wardens' line.

City of Philadelphia, to build pier in the Delaware River at the foot of Chestnut street.

Reading Company, to construct, establish, and maintain ferry racks and accessories immediately south of Chestnut street.

The Pennsylvania Warehousing and Safe Deposit Company, to extend Piers 22 and 24 south to the new wardens' line.

Pennsylvania Railroad Company, to extend Pier 14 North wharves.

Estate of David Jayne (deceased), to extend Pier 15 North wharves.

Edward T. and A. D. Warner, to extend Pier 9 South wharves.

Philadelphia and Reading Railway Company, to extend Pier 25 north to the new wardens' line.

Very truly, yours,

GEO. F. SPROULE, *Secretary.*

Mr. W. R. TUCKER,
Secretary, Board of Harbor Commissioners.

INCLOSURE C.

BOARD OF HARBOR COMMISSIONERS FOR THE CITY OF PHILADELPHIA, PA.

To the Honorable the Senate and House of Representatives of the State of Pennsylvania in Assembly met:

This memorial of the board of harbor commissioners for the city of Philadelphia respectfully represents:

That the Government of the United States, State of Pennsylvania, and the city of Philadelphia are expending nearly $6,000,000 in the improvement of the harbor of the port of Philadelphia, the widening of Delaware avenue, and the readjustment of wharf and dock facilities of the port; to this expenditure must be added the large amount which will be necessary for the improvement of private wharves;

That these improvements are made necessary in order that Philadelphia may be able to accommodate vessels of the modern type now engaged in carrying the commerce of the world;

That under the existing laws governing the board of port wardens the minimum width of docks provided therein is 80 feet by the act of April, 1868, which may

have been of sufficient width at the time of the passage of the act regulating same, but is now entirely too narrow for vessels of the present day;

That to continue the reconstruction of the water front on the Delaware River with docks for deep-sea and foreign commerce less than 150 feet in width would be most unwise and not in keeping with the public spirit which prompted the improvement of the harbor, and would seriously militate against Philadelphia and the efforts being made to place her in a position to compete successfully with the rival ports on the Atlantic Coast for a share of the nation's commerce: Therefore,

Your memorialist, the board of harbor commissioners for the city of Philadelphia, petitions your honorable bodies to enact as law House bill No. 120, which has passed the House of Representatives and is now pending in the Senate, intending to amend the fifth section of an act of assembly passed the 8th day of April, 1868, so that hereafter wharves to be extended must have between them and adjoining wharves on each side a dock or water space of at least "one hundred and fifty feet," except as provided in the said bill.

And your memorialist will ever pray.

CHARLES PLATT, *President.*
WILLIAM R. TUCKER, *Secretary.*

G 3.

IMPROVEMENT OF SCHUYLKILL RIVER, PENNSYLVANIA.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 915.

Under date of November 6, 1896, contract was entered into with the Virginia Dredging Company, of Richmond, Va., for dredging a channel across the bar at the river's mouth.

During the past fiscal year the contract above referred to was completed, 62,983 cubic yards of material, scow measurement, having been dredged from the channel, at a cost of $9,551.95, including cost of inspection and superintendence.

It is proposed to apply the sum of $14,473.76, which remains available, to further improvement of the channel at or near the mouth of the river; but it is considered desirable to defer the work until next season, when the effects of the currents under the new conditions will have been determined.

During the past two years the city of Philadelphia has been engaged in improving the channel of this river under authorities of the Secretary of War dated September 3, 1895, and May 14, 1896. Up to the end of the past fiscal year about 91,830 cubic yards of material as measured in the dump had been removed from the channel and placed ashore.

These works have resulted in the formation of a channel with a minimum mean low-water depth of 24 feet and a minimum width of about 125 feet through the bar at the mouth of the river, and a channel with a depth of 22 feet at mean low water and a width of 250 feet for a distance of about half a mile above the Penrose Ferry Bridge.

This improvement can be completed in accordance with the adopted project with the funds now available. The river and harbor act of June 3, 1896, provides for a survey of the river with a view to further improvement. This survey is now in progress.

This work lies in the collection district of Philadelphia, at which, as a port of entry, there was collected during the year ending December 31, 1896, revenue to the amount of $12,657,803.42. The nearest fort and light-houses are, respectively, Fort Mifflin and Schuylkill River Range Lights.

Money statement.

July 1, 1896, balance unexpended	$24,033.71
June 30, 1897, amount expended during fiscal year	9,559.95
July 1, 1897, balance unexpended	14,473.76

APPROPRIATIONS.

Act of—		Act of—	
June 11, 1870	$15,000	August 2, 1882	$25,000
March 3, 1871	10,000	July 5, 1884	25,000
June 10, 1872	40,000	August 5, 1886	18,750
March 3, 1873	40,000	August 11, 1888	25,000
June 23, 1874	20,000	September 19, 1890	45,000
March 3, 1875	20,000	July 13, 1892	46,250
August 14, 1876	20,000	August 17, 1894	20,000
June 18, 1878	30,000	June 3, 1896	20,000
March 3, 1879	25,000		
June 14, 1880	40,000	Total	525,000
March 3, 1881	40,000		

EXPENDITURES.

Total to June 30, 1897 ..... $510,526.24

Abstract of proposals for dredging in Schuylkill River, Pennsylvania, opened October 17, 1896, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 57,000 cubic yards.]

No.	Name and address of bidder.	Per cubic yard.	Amount.
		Cents.	
1	John P. Randerson, Albany, N. Y.	25½	$14,585
2	American Dredging Co., Philadelphia, Pa.	21	11,970
3	Virginia Dredging Co., Richmond, Va.	13 4/10	7,638
4	Delaware Construction Co., Wilmington, Del.	19	10,830
5	Frank C. Somers, Camden, N. J.	17 8/10	10,203

Contract (dated November 6, 1896) entered into with the Virginia Dredging Company.

COMMERCIAL STATISTICS.

The following statement of the foreign and domestic commerce of the Schuylkill River for the years ending December 31, 1895 and 1896, has been compiled from returns made to this office by shippers, consignees, and carriers:

Freight movement.

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
ARRIVING.				
Asphalt	19,149	$301,440	13,293	$191,295
Chemicals	18,199	91,834	17,729	91,277
Clay	3,201	5,119	1,839	2,939
Coal	301,490	995,765	385,725	1,369,024
Hay	1,664	13,189	1,547	12,285
Ice	95,394	165,788	115,470	231,040
Iron ore	125,956	629,780	80,481	482,886
Lumber	76,589	499,895	60,624	361,781
Stone, building	51,414	428,631	23,883	196,878
Stone, paving	24,615	96,499	7,989	30,456
Sand	459,562	226,666	467,802	250,191
Wood, cord	12,775	66,125	27,084	100,613
Miscellaneous	117,177	7,152,193	77,184	5,224,567
Total	1,307,185	10,672,924	1,280,650	8,545,232
DEPARTING.				
Asphalt	.....	.....	567	28,350
Chemicals	2,223	30,378	2,868	60,071
Coal	251,245	901,096	197,284	760,462
Grain	34,755	618,700	62,450	786,000
Ice	2,502	7,686	.....	.....
Manure	67,678	92,003	88,682	132,534
Petroleum oil and products	1,059,930	18,008,184	1,542,898	20,489,040
Miscellaneous	63,474	3,258,297	89,086	3,495,919
Total	1,481,867	22,916,344	1,933,835	25,752,376

Vessel movement.

Class.	1895.		1896.	
	Arrivals.	Departures.	Arrivals.	Departures.
Steamers	146	1,010	224	1,032
Sailing vessels	651	332	445	290
Canal boats and barges	3,919	1,970	4,489	2,341
Total	4,716	3,312	5,158	3,663

G 4.

IMPROVEMENT OF ICE HARBOR AT MARCUSHOOK, PENNSYLVANIA.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 918.

Since 1889 expenditures have been confined to maintenance and repairs.

During the past fiscal year no work was done. It is proposed to repair the lower landing pier during the current working season, at an estimated cost of $1,000.

The funds now available are considered sufficient for all probable necessities.

This work is located in the collection district of Philadelphia. This is the nearest port of entry, the collections during the year ending December 31, 1896, amounting to $12,657,803.42. The nearest fort and light-house are, respectively, Fort Mifflin and Christiana Light.

Money statement.

July 1, 1896, balance unexpended	$2,415.72
July 1, 1897, balance unexpended	2,415.72

APPROPRIATIONS.

Act of—		Act of—	
June 23, 1866	$5,000	August 5, 1886	$15,000
March 2, 1867	94,000	August 11, 1888	15,000
January 14, 1880	35,000	September 19, 1890	5,000
March 3, 1881	30,000		
August 2, 1882	15,000	Total	214,000

EXPENDITURES.

Total to June 30, 1897	$211,584.28

G 5.

CONSTRUCTION OF IRON PIER IN DELAWARE BAY, NEAR LEWES, DELAWARE.

An account of this work is contained in the Annual Report of the Chief of Engineers for 1896, page 920.

The river and harbor act of June 3, 1896, appropriated $7,660 for the maintenance and repair of this pier.

On September 11, 1896, a project for the application of the funds appropriated was submitted to the Department and approved September 18, 1896. This project provides for the repair of the fender system and the superstructure of the pier. Work under this project will be undertaken during the coming fiscal year. During the past fiscal year, three of the cast-iron columns, used in repairing the pier in 1891, were undermined by scour and dropped out of their caps.

The advertising of the work has been postponed until all danger of a continuation of the damage to this part of the structure is passed.

This pier is in the collection district of Delaware, the nearest port of entry being Wilmington, where the amount of revenue collected during the year ending December 31, 1896, was $10,160. The nearest fort and light-house are, respectively, Fort Delaware and Delaware Breakwater Light.

Money statement.

July 1, 1896, balance unexpended	$7,660.00
July 1, 1897, balance unexpended	7,660.00

APPROPRIATIONS.

Act of—		Act of—	
July 15, 1870	$225,000	June 14, 1880	$10,000
June 23, 1874	10,000	March 3, 1881	10,000
March 3, 1875	25,000	August 2, 1882	13,000
March 3, 1875	15,000	April 4, 1890	10,000
August 14, 1876	30,000	June 3, 1896	7,660
June 18, 1878	20,000		
March 3, 1879	10,500	Total	386,160

EXPENDITURES.

Total to June 30, 1897	$378,500

G 6.

IMPROVEMENT OF DELAWARE BREAKWATER, DELAWARE.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 922.

Work under the contract dated November 16, 1894, with George Willett Andrews, of Biddeford, Me., for depositing stone in cavities and building a part of the superstructure of the breakwater, was completed on October 15, 1896. Under this contract 16,149$\frac{18}{22}\frac{95}{40}$ tons of stone was placed in the work, of which 7,532$\frac{5}{22}\frac{10}{40}$ tons was deposited during the past fiscal year.

Under date of September 15, 1896, contract was entered into with John F. Donovan, of New York, N. Y., for continuing the work of closing the gap in the breakwater by furnishing and depositing stone to the extent of the funds available, the work to be commenced on or before April 1, 1897, and completed on or before June 30, 1898. Work under this contract was commenced on April 1, 1897, and is now in progress, and during the past fiscal year about 9,546 tons of stone were deposited.

The total amount of stone deposited in the work during the past fiscal year was about 17,078 tons. The total quantity deposited under the present project is about 180,176 tons.

The present condition of the work is as follows:

The substructure has been fully completed to the level of mean low water. The superstructure has been fully completed for a distance of 464 feet from the ice breaker and partly constructed for a further distance of 46 feet.

Under the present contract the superstructure has been partially completed for a distance of 150 feet from the breakwater.

Owing to the low prices obtained in the last contract, the work can be fully completed with funds now available, and no further appropriation is required.

It appears from a survey of the Breakwater Harbor made in June

1897, that slight shoaling has continued over the middle bar and scour, has taken place between the bar and the Delaware shore.

The commercial statistics of the harbor at and in the vicinity of this breakwater are given in connection with the report on the Harbor of Refuge, Delaware Bay, Del.

This work is situated in the collection district of Delaware. Wilmington is the nearest port of entry, at which the revenue collected during the year ending December 31, 1896, was $10,160. Fort Delaware is the nearest fort and the Breakwater Light the nearest light-house.

Money statement.

July 1, 1896, balance unexpended		$108,365.49
June 30, 1897, amount expended during fiscal year		22,003.93
July 1, 1897, balance unexpended		86,361.56
July 1, 1897, outstanding liabilities	$22,242.18	
July 1, 1897, amount covered by uncompleted contracts	47,657.82	
		69,900.00
July 1, 1897, balance available		16,461.56

APPROPRIATIONS.

Act of—		Act of—	
May 7, 1822	$22,700.00	June 23, 1866	$107,910.00
May 23, 1828	250,000.00	March 2, 1867	109,493.70
April 23, 1830	162,000.00	August 2, 1882	125,000.00
March 2, 1831	208,000.00	July 5, 1884	75,000.00
July 3, 1832	270,000.00	August 5, 1886	56,250.00
March 3, 1833	270,000.00	August 11, 1888	100,000.00
June 28, 1834	270,000.00	September 19, 1890	80,000.00
March 3, 1835	100,000.00	July 13, 1892	50,000.00
July 2, 1836	100,000.00	August 17, 1894	50,000.00
July 4, 1836 (survey)	1,000.00	June 3, 1896	80,000.00
March 3, 1837	141,000.00		
July 7, 1838	150,000.00	Total	2,808,353.70
August 30, 1852	30,000.00		

Total amount appropriated under present project to June 30, 1897.... $616,250.00

EXPENDITURES.

Total to June 30, 1897	$2,721,992.14
Total under present project to June 30, 1897	529,888.44

Abstract of proposals for furnishing and depositing stone in the Gap at the Delaware Breakwater, Delaware, opened September 9, 1896, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Stone for leveling upper surface, etc. (14,700 tons), per ton.	Large stone to be placed in superstructure (9,300 tons), per ton.	Amount.
1	Wm. B. Gray, Baltimore, Md	$2.23	$4.21	$71,934
2	John F. Donovan, New York, N. Y	2.33	2.33	55,920
3	John L. Grim, Philadelphia, Pa	2.50	3.15	66,045
4	Wm. S. White, Rockland, Me	2.35	3.65	68,490
5	John A. Bouker, New York, N. Y	2.55	2.95	64,920
6	George Willett Andrews, Biddeford, Me	4.12	4.12	98,880
7	David V. Howell, New York, N. Y	2.18	3.48	64,410

Contract (dated September 15, 1896) entered into with John F. Donovan. In progress.

CONTRACT IN FORCE, WITH NAME OF CONTRACTOR, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

With John F. Donovan, of New York, N. Y., dated September 15 and approved October 15, 1896, for furnishing and depositing stone in the Gap. To be commenced on or before April 1, 1897, and completed on or before June 30, 1898.

G 7.

CONSTRUCTION OF HARBOR OF REFUGE, DELAWARE BAY, DELAWARE.

The river and harbor act of June 3, 1896, contains an appropriation of $5,000 for the construction of this harbor in accordance with plans submitted by the Chief of Engineers on January 29, 1892. The act contains the following provisions:

Provided, That contracts may be entered into by the Secretary of War for such material and work as may be necessary to complete said harbor of refuge, to be paid for as appropriation may from time to time be made by law, not to exceed in the aggregate four million six hundred and sixty thousand dollars, exclusive of the amount herein appropriated: *Provided further*, That in making such contracts the Secretary of War shall not obligate the Government to pay in any one fiscal year, beginning July first, eighteen hundred and ninety-seven, more than twenty-five per centum of the whole amount authorized to be expended.

The plans submitted by the Chief of Engineers on January 29, 1892, are contained in the report of a commission of engineer officers, dated January 5, 1892, and printed in House Ex. Doc. No. 112, Fifty-second Congress, first session, and also in the Annual Report of the Chief of Engineers for 1892, page 941. This commission was constituted under the provisions of the river and harbor act of September 19, 1890, with a view of determining the best site near the mouth of Delaware Bay for a national harbor of refuge suitable for deep-draft vessels.

The plans provide for the formation of a harbor by the construction of a stone breakwater located upon the line of least depth along the eastern branch of the shoal known as the "Shears," situated about 2¼ miles north of the existing breakwater. Against the heaviest storms, those from the east-northeast, the projected harbor has a protected anchorage area of 552 acres with a minimum low-water depth of 30 feet, and an additional area of 237 acres with a minimum low-water depth of 24 feet. It will furnish free and good anchorage to more than a thousand vessels at once. The project provides for the construction of a row of ice piers across the upper end of the harbor to protect it from ice descending the bay. The cost of the work as estimated by the Commission was $4,665,000.

During August and September, 1896, soundings and borings were made along the site of the proposed breakwater to determine the exact character of the bottom and to ascertain whether changes have occurred since the survey made under the directions of the Commission in 1891. It was found that no material changes have occurred and that the bottom is very compact.

A project for the execution of the principal part of this work, dated September 3, 1896, was approved by the Secretary of War on October 14, 1896. It provides for the construction of the harbor of refuge, except the ice piers, in accordance with the general project approved by Congress, the work to be done under the continuous-contract system and to be paid for from appropriations made from time to time by law. The construction of the ice piers was not provided for in this project, since it is believed that they can be better designed and located and more economically constructed after a portion of the breakwater has been completed.

Under date of February 5, 1897, contract was entered into with

Messrs. Hughes Brothers & Bangs, of Syracuse, N. Y., for the construction of the entire breakwater in accordance with the approved project. The contract requires the placing of 200,000 tons of stone during the year ending December 31, 1897, and the continuance of the work as rapidly as may be required to the extent of placing 280,000 tons during any one calendar year, provided sufficient funds are available for payment therefor. The breakwater is to be completed on or before December 31, 1901, unless prevented by lack of funds.

The work of constructing the breakwater was commenced on May 4, 1897, by the erection of a stake-light at the initial point for the protection of navigation and the deposit of 628 tons of stone. During the past fiscal year about 9,035 tons of stone were deposited in the work.

With the low price provided for in the contract, the estimated cost of executing the project should be greatly reduced. The cost will depend to some extent upon the rate of progress, and this will depend upon the amounts annually appropriated. If the appropriations are sufficient to provide for the rapid and economical execution of the work, it is believed that the total cost will not exceed $2,350,000, or about one-half the original estimate.

The great value of this harbor to commerce is due to its location. It is about equidistant from New York, Philadelphia, and the capes of Chesapeake Bay (the ocean entrance to the ports of Baltimore, Norfolk, and Newport News), and is, therefore, an especially convenient point of call for the entire commerce of the North Atlantic coast. It is now largely used by vessels awaiting orders to ports for discharge or loading, although the anchorage is exposed and dangerous, as only small vessels can find shelter in the old breakwater harbor.

The statistics appended to this report show the importance of this anchorage even under the present disadvantageous conditions. As an example of the value of the commerce at this locality, it may be mentioned, as a single item, that during the year 1896 233 vessels, laden with about 450,000 tons of sugar, arrived at this harbor. The value of these cargoes is estimated at $32,000,000 and the approximate value of the vessels at more than $8,000,000.

By the construction of this breakwater the usefulness of this anchorage will be greatly increased, not only as a port of call but also as a harbor of refuge. Vessels bound from northern to southern or from southern to northern ports will be able to go to sea in doubtful weather with the assurance of finding ample protection at the Delaware Capes if overtaken by storms.

This work is situated in the collection district of Delaware. Wilmington is the nearest port of entry, at which the revenue collected during the year ending December 31, 1896, was $10,160. Fort Delaware is the nearest fort, and the Breakwater light the nearest light-house.

Money statement.

July 1, 1896, balance unexpended		$5,000.00
Amount appropriated by sundry civil act approved June 4, 1897		394,334.00
		399,334.00
June 30, 1897, amount expended during fiscal year		2,394.02
July 1, 1897, balance unexpended		396,939.98
July 1, 1897, outstanding liabilities	$10,695.18	
July 1, 1897, amount covered by uncompleted contracts	386,244.80	
		396,939.98
Amount (estimated) required for completion of existing project		2,350,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		800,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1887 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

Act of—	
June 3, 1896	$5,000.00
June 4, 1897	394,334.00
Total	399,334.00

EXPENDITURES.

Total to June 30, 1897	$2,394.02

Abstract of proposals for constructing stone breakwater in Delaware Bay, Delaware, opened December 10, 1896, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Approximate quantities.		Amount.
		Stone placed in the substructure (1,210,665 tons of 2,000 pounds), per ton.	Stone placed in the superstructure (173,745 tons of 2,000 pounds), per ton.	
1	James McCarron, Philadelphia, Pa	$1.31	$1.39	$1,827,476.70
2	The National Contracting Co., New York, N. Y	1.59	1.93	2,260,285.20
3	John L. Grim, Philadelphia, Pa	1.43	2.92	2,238,586.35
4	John M. Sharp, Philadelphia, Pa	2.37½	3.75	3,526,873.13
5	Hughes Bros. & Bangs, Syracuse, N. Y	1.18⅜	1.18⅜	1,638,795.33
6	Christie & Lowe, Chicago, Ill	1.50	2.50	2,250,360.00
7	Wm. B. Gray, Baltimore, Md	2.30	3.04	3,312,714.30
8	Andrew Onderdonk, New York, N. Y	1.80	3.00	2,700,432.00
9	Gwilliam & Miller, Philadelphia, Pa	2.46	3.90	3,655,841.40
10	William Bailey Thomas, Atlanta, Ga	2.05	2.30	2,881,476.75
11	John Pierce and Thomas E. Crimmins, New York, N. Y., and J. W. Hoffman, Philadelphia, Pa	1.89	1.89	2,616,534.90
12	Booth Bros. & Hurricane Isle Granite Co., New York, N. Y.; Rockport Granite Co., Rockport, Mass.; McClenahan & Bro. Granite Co., Port Deposit, Md., and The Brandywine Granite Co., Wilmington, Del	2.23	3.98	3,391,288.05
13	Venable Construction Co., Atlanta, Ga	2.76	3.80	4,001,666.40

Contract (dated February 5, 1897) entered into with Hughes Bros. & Bangs. In progress.

CONTRACT IN FORCE, WITH NAMES OF CONTRACTORS, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

With Hughes Bros. & Bangs, of Syracuse, N. Y., dated February 5 and approved February 20, 1897, for complete execution of the work of constructing a stone breakwater, to be paid for as appropriations may be made from time to time by law. To be commenced on or before May 1, 1897, and completed on or before December 31, 1901, unless prevented by lack of funds.

COMMERCIAL STATISTICS.

During the year ending December 31, 1896, the following vessels called at Delaware Breakwater for the reasons given:

	Steamers.	Ships.	Barks.	Brigs.	Schooners.	Barges.	Total.
For orders	114	19	52	16	33	.....	234
For harbor	68	5	16	11	1,223	90	1,413
In distress	.....	.....	1	.....	7	.....	8
Total	182	24	69	27	1,263	90	1,655

G 8.

IMPROVEMENT OF RANCOCAS RIVER, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 925.

The original project adopted in 1881 provided for the improvement of the main river and the Mount Holly Branch and contemplated no improvement in the Lumberton Branch. The river and harbor act of June 3, 1896, appropriated $2,000 for continuing this improvement, this sum to be expended in the improvement of the Lumberton Branch.

During the past fiscal year the Lumberton Branch was surveyed as far as Lumberton, N. J., and a project for its improvement was submitted on June 24, 1897. The project provides for the formation by dredging of a channel 30 feet wide and 6 feet deep at mean low water through the shoals at Pattersons Landing and below and above Paxsons Landing, which are the only important obstructions to navigation. Should the project receive the approval of the Department, it is proposed to do the work during the present season. It can be completed with funds now available.

This work is situated in the collection district of Burlington, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1896. The nearest fort is Fort Mifflin, and the Horseshoe lights are the nearest light-houses.

Money statement.

July 1, 1896, balance unexpended	$2,399.70
June 30, 1897, amount expended during fiscal year	232.41
July 1, 1897, balance unexpended	2,167.29
July 1, 1897, balance remaining from appropriation of August 17, 1894, not available for expenditure under existing project	399.70
July 1, 1897, balance available	1,767.59

APPROPRIATIONS.

Mount Holly Branch.

Act of—	
March 3, 1881	$10,000.00
August 2, 1882	10,000.00
September 19, 1890	10,000.00
July 13, 1892	5,000.00
August 17, 1894	3,000.00
	38,000.00

Lumberton Branch.

Act of June 3, 1896	2,000.00
Total	40,000.00

EXPENDITURES.

Total to June 30, 1897	$37,732.62
Carried to the surplus fund in July, 1890	100.09

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the years ending December 31, 1895 and 1896.

Kind of vessels.	Arrivals.				Departures.			
	1895.		1896.		1895.		1896.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Steamers	445	85,000	398	79,600	445	85,000	398	79,600
Sailing vessels	158	8,800	107	6,420	158	8,800	107	6,420
Barges	1,685	425,000	1,424	427,200	1,685	425,000	1,424	427,200
Canal boats	1,000	100,000	2,023	202,300	1,000	100,000	2,023	202,300
Total	3,288	618,800	3,952	715,520	3,288	618,800	3,952	715,520

Freight statement.

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
ARRIVING.				
Chemicals	5,900	$37,400	6,300	$40,300
Coal	19,998	79,992	16,400	50,600
Iron, pig	5,000	50,000	4,000	45,000
Lime	5,500	11,000	4,000	8,000
Lumber	2,000	26,000	1,000	21,000
Manure	38,000	57,000	37,500	50,000
General merchandise	7,841	733,200	11,800	397,000
Total	84,239	994,592	81,000	611,900
DEPARTING.				
Brick	9 000	20,000	10,000	22,000
Canned goods	500	26,000	500	25,000
Sand, molding	93,000	139,500	66,700	93,425
Sand and gravel	172,775	86,010	149,725	59,890
Produce	10,500	420,000	3,600	140,000
General merchandise	1,500	53,500	1,000	23,500
Total	287,275	745,010	231 525	363,815

G 9.

IMPROVEMENT OF ALLOWAY CREEK, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 928.

Under date of March 16, 1897, contract was entered into with John L. Grim, of Philadelphia, Pa., for the construction of about 400 linear feet of pile dike and the dredging of about 7,500 cubic yards of material, scow measurement, from the channel of the creek above Upper Hancock Bridge.

During the past fiscal year 404 feet of dike was constructed.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1896. The nearest fort is Fort Delaware, and the Reedy Island Light is the nearest light-house.

Money statement.

July 1, 1896, balance unexpended	$3,001.28
June 30, 1897, amount expended during fiscal year	235.20
July 1, 1897, balance unexpended	2,766.08
July 1, 1897, amount covered by uncompleted contracts	2,766.08
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

Act of—	
September 19, 1890	$6,000.00
July 13, 1892	3,000.00
August 17, 1894	3,000.00
June 3, 1896	3,000.00
Total	15,000.00

EXPENDITURES.

Total to June 30, 1897	$12,233.92

Abstract of proposals for constructing a pile dike and dredging in Alloway Creek, New Jersey, opened March 10, 1897, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Approximate quantities.		Amount.
		Timber work of dike, including iron work (400 linear feet), per linear foot.	Material to be removed (7,500 cubic yards), per cubic yard.	
			Cents.	
1	Frank C. Somers, Camden, N. J.	$3.73	23	$3,217
2	John L. Grim, Philadelphia, Pa.	3.60	18	2,790
3	Delaware Construction Co., Wilmington, Del.	5.25	15	3,225

Contract (dated March 16, 1897) entered into with John L. Grim. In progress.

CONTRACT IN FORCE, WITH NAME OF CONTRACTOR, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

With John L. Grim, of Philadelphia, Pa., dated March 16, 1897, not yet approved, for constructing a pile dike and dredging; to be commenced on or before May 1, 1897, and completed on or before July 31, 1897.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the years ending December 31, 1895 and 1896.

Kind of vessel.	Arrivals.				Departures.			
	1895.		1896.		1895.		1896.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Steamers	65	6,850	65	6,850	65	6,850	65	6,850
Sailing vessels	35	3,500	35	3,500	35	3,500	35	3,500
Barges and canal boats	62	9,300	62	9,300	62	9,300	62	9,300
Total	162	19,650	162	19,650	162	19,650	162	19,650

Freight statement.

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
ARRIVING.				
Coal	9,000	$22,500	9,000	$23,000
Glass sand	1,600	1,760	1,700	1,850
Lumber	4,000	40,000	3,500	37,000
Oyster shells	2,500	5,000	2,500	5,000
Soda ash	450	9,000	450	8,500
Tin plate	1,300	112,000	1,300	110,000
Miscellaneous	9,000	200,000	9,000	197,000
Total	27,850	390,260	27,450	382,350
DEPARTING.				
Canned goods	8,500	382,500	8,000	379,000
Glass	2,000	110,000	2,000	110,000
Grain and farm produce	3,500	60,000	3,500	58,000
Ship timber	150	3,500	125	3,000
Miscellaneous	1,000	4,000	1,000	3,500
Total	15,150	560,000	14,625	553,500

G 10.

IMPROVEMENT OF DENNIS CREEK, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 929.

Under date of March 15, 1896, contract was entered into with Frank C. Somers, of Camden, N. J., for dredging about 40,000 cubic yards of material and removing an old wreck from the channel. Work under this contract was commenced on March 22, 1897.

During the past fiscal year 38,613 cubic yards of material were dredged from the channel, and the wreck was removed, work under the contract being completed on May 13, 1897. By this work the entire improvement was completed.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1896. The nearest fort is Fort Delaware, and the Maurice River Light is the nearest light-house.

Money statement.

July 1, 1896, balance unexpended	$5,000.00
June 30, 1897, amount expended during fiscal year	4,701.05
July 1, 1897, balance unexpended	298.95

APPROPRIATION.

Act of June 3, 1896	$5,000.00

EXPENDITURES.

Total to June 30, 1897	4,701.05

Abstract of proposals for dredging in Dennis Creek, New Jersey, opened March 10, 1897, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, including removal of wreck below Dennisville Bridge, 40,000 cubic yards.]

No.	Name and address of bidder.	Per cubic yard.	Amount.
		Cents.	
1	Frank C. Somers, Camden, N. J	11	$4,400
2	Delaware Construction Co., Wilmington, Del	17	6,800
3	John L. Grim, Philadelphia, Pa	18	7,200
4	J. J. Williams & Co., Chester, Pa	12½	5,000

Contract (dated March 15, 1897) entered into with Frank C. Somers.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Sailing vessels	37	1,020	37	1,020

Freight statement.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
Arriving:			Departing:		
Coal	300	$1,500	Hay	250	$1,000
Grain	1,500	20,000	Lumber	454	5,000
Lime	400	600	Rails	800	4,000
Lumber	600	6,000	Wood (cords)	900	3,600
Manure	500	1,000	General merchandise	200	2,000
Stone	65	300			
General merchandise	503	5,300	Total	2,604	15,600
Total	3,868	35,200			

G II.

IMPROVEMENT OF COOPER CREEK, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 931.

The river and harbor act of June 3, 1896, appropriated $37,000 for completing this improvement, of which amount $2,500, or so much thereof as might be necessary, was to be expended in rebuilding the dike on Government reservation in the Delaware River at Woodbury Creek.

Under date of October 7, 1896, contract was entered into with Frank C. Somers, of Camden, N. J., for rebuilding the dike on the Government reservation at Woodbury Creek. Work under this contract was completed on November 13, 1896, the total amount expended being $2,500.

Under date of October 19, 1896, contract was entered into with A. M. Clegg, of Washington, D. C., for dredging about 162,000 cubic yards of material from the channel of the creek, in completion of the project. Work under this contract was commenced on April 12, 1897.

During the past fiscal year 55 cubic yards of material, scow measurement, were dredged from the channel.

This work is located in the collection district of Philadelphia. This is the nearest port of entry. The collections during the year ending December 31, 1896, amounted to $12,657,803.42. The nearest fort and light-house are, respectively, Fort Mifflin and Schuylkill River range lights.

Money statement.

July 1, 1896, balance unexpended		$37,000.00
June 30, 1897, amount expended during fiscal year		2,889.94
July 1, 1897, balance unexpended		34,110.06
July 1, 1897, outstanding liabilities	$7.53	
July 1, 1897, amount covered by uncompleted contracts	22,254.97	
		22,262.50
July 1, 1897, balance available		11,847.56

APPROPRIATIONS.

Act June 3, 1896	$37,000.00

EXPENDITURES.

Total to June 30, 1897	$2,889.94

Abstract of proposals for dredging in Cooper Creek, New Jersey, opened October 5, 1896, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 162,500 cubic yards.]

No.	Name and address of bidder.	Per cubic yard.	Amount.
		Cents.	
1	John P. Randerson, Albany, N. Y.	19½	$32,093.75
2	American Dredging Co., Philadelphia, Pa.	24	39,000.00
3	Virginia Dredging Co., Richmond, Va.	19 7/10	32,012.50
4	Hess & Co., Detroit, Mich.	24	39,000.00
5	Frank C. Somers, Camden, N. J.	17¾	28,843.75
6	A. M. Clegg, Washington, D. C.	13 7/10	22,262.50

Contract (dated October 19, 1896) entered into with A. M. Clegg. In progress.

CONTRACT IN FORCE, WITH NAME OF CONTRACTOR, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

With A. M. Clegg, of Washington, D. C., dated October 19, and approved October 27, 1896, for the removal of about 162,000 cubic yards of material from the channel of the river. To be commenced on or before April 1, 1897, and completed on or before December 31, 1897.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	2	600	2	600
Sailing vessels	60	6,000	60	6,000
Barges and canal boats	626	125,200	626	125,200
Total	688	131,800	688	131,800

Freight statement.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
Arriving:			Departing:		
Bricks	800	$3,500	Chemicals	200	$2,800
Chemicals	8,406	93,225	Fertilizers	7,000	140,000
Coal	45,167	124,848	Iron, manufactured	23,615	472,300
Fertilizer	5,241	35,900	Produce	32,000	640,000
Hay	1,269	8,583	Miscellaneous	1,680	212,838
Iron, pig	38,346	426,306			
Lumber	1,545	13,450	Total	64,495	1,467,438
Manure	25,000	37,500			
Oil	431	84,471			
Sand	7,402	7,344			
Miscellaneous	3,494	663,444			
Total	137,101	1,448,571			

G 12.

IMPROVEMENT OF GOSHEN CREEK, NEW JERSEY.

An account of this improvement is contained in the Annual Report of the Chief of Engineers for 1896, page 933.

During 1893, 15,770 cubic yards of material, scow measurement, was dredged from the channel below Goshen Landing, thus practically completing the improvement to the mouth of the creek. Work was then discontinued until 1897 for want of sufficient funds.

Under date of March 15, 1897, contract was entered into with Mr. Frank C. Somers, of Camden, N. J., for constructing about 600 feet of pile dike at the entrance of the creek and dredging about 8,000 cubic yards, scow measurement, from the channel. Work under this contract was commenced on May 18, 1897.

During the past fiscal year the pile dike was constructed to its projected length of 600 feet and 8,002 cubic yards of material, dipper measurement, was removed from the channel in the vicinity of the dike, completing work under this contract on June 30, 1897.

In order to maintain the dredged channel at the mouth it will be necessary to extend the dike somewhat farther toward the shore. This can be done without increasing the original estimate.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1896. The nearest fort is Fort Delaware, and the Maurice River Light is the nearest light-house.

Money statement.

July 1, 1896, balance unexpended	$6,000.00
June 30, 1897, amount expended during fiscal year	162.60
July 1, 1897, balance unexpended	5,837.40
July 1, 1897, outstanding liabilities	4,198.61
July 1, 1897, balance available	1,638.79
Amount (estimated) required for completion of existing project	3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

Act of—	
July 13, 1892	$3,000.00
August 17, 1894	3,000.00
June 3, 1896	3,000.00
Total	9,000.00

EXPENDITURES.

Total to June 30, 1897	$3,162 60

Abstract of proposals for constructing a pile dike and dredging at the mouth of Goshen Creek, New Jersey, opened March 10, 1897, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Approximate quantities.		Amount.
		Timber work of dike, including ironwork (600 linear feet), per linear foot.	Material to be removed (8,000 cubic yards), per cubic yard.	
			Cents.	
1	Frank C. Somers, Camden, N. J	$4.99	14	$4,114
2	John L. Grim, Philadelphia, Pa	5.38	13¾	4,328
3	Delaware Construction Co., Wilmington, Del	7.00	14	5,320

Contract (dated March 15, 1897) entered into with Frank C. Somers.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the years ending December 31, 1895 and 1896.

Kind of vessel.	Arrivals.				Departures.			
	1895.		1896.		1895.		1896.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Sailing vessel	200	4,000	100	2,000	200	4,000	100	2,000

Freight statement.

Articles.	1895.		1896.	
	Tons.	Value.	Tons.	Value.
ARRIVING.				
Brick	300	$1,200	2,000	$8,000
Coal	1,500	7,500	1,000	5,000
Fertilizer	300	10,500	1,000	32,000
Grain	1,700	30,500	3,000	54,000
Lime	1,500	3,000	.....	.....
Lumber	1,500	14,000	2,000	19,000
General merchandise	3,000	150,000	1,500	75,000
Total	9,800	216,700	10,500	193,000
DEPARTING.				
Clams	900	9,000	.....	.....
Fertilizer	1,000	4,000	500	2,000
Hay	2,000	10,000	1,500	8,000
Oysters and clams	.....	.....	1,800	30,800
Potatoes	500	1,875	300	1,125
Sand	3,000	3,000	4,000	4,000
Wood	2,000	12,000	1,700	10,000
General merchandise	1,000	15,000	1,800	27,000
Total	10,400	54,875	10,800	82,925

G 13.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

During the past fiscal year 3 wrecks have been removed under the authority of the act of Congress approved June 14, 1880.

In May, 1896, the two-masted schooner *Palestine*, with a cargo of oysters, struck on the outer bar of Great Egg Harbor Inlet, New Jersey, sprung aleak, and sank in the channel. The wreck being considered a dangerous obstruction to navigation, its removal was recommended.

In May, 1896, while entering Great Egg Harbor Inlet, New Jersey, the three-masted schooner *Alice Bell*, with a cargo of ice, was sunk in the channel. The wreck being considered a dangerous obstruction to navigation, its removal was recommended.

Under date of September 5, 1896, a contract was entered into with Somers S. Van Sant for removal of the above wrecks for the sum of $265. The removal of the wrecks was completed in September, 1896.

In October, 1896, the barge *Our Little Harry*, loaded with sand, was sunk in the channel of the Delaware River opposite the eastern end of League Island. The wreck being a dangerous obstruction to navigation, its removal was recommended. Under date of January 28, 1897, a contract was entered into with John L. Mills for removal of the wreck for the sum of $627. The work was completed in March, 1897.

In September, 1895, the three masted schooner *Lottie K. Friend*, with a cargo of coal, was sunk in Delaware Bay, in collision with another vessel, about 1¼ miles west from Ship John Light. The wreck being considered a dangerous obstruction to navigation, its removal was recommended. Under date of February 18, 1897, a contract was entered into with Thomas Poynter and Elijah D. Register for the removal of the wreck for the sum of $1,100. The work of removal of this wreck has not yet been completed.

The amount expended during the past fiscal year upon removal of wrecks is $1,403.58.

Abstract of proposals for removal of wrecks of schooners Palestine and Alice Bell, lying in Great Egg Harbor Inlet, New Jersey, opened August 31, 1896, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Cornelius J. Kelly, Atlantic City, N. J	$737
2	Gilbert M. Van Sant, Atlantic City, N. J	1,374
3	Virden & Ross, Lewes, Del	1,785
4	Torrance & Idell, Philadelphia Pa	724
5	Somers S. Van Sant, Somers Point, N. J	265

Contract (dated September 5, 1896) entered into with Somers S. Van Sant.

Abstract of proposals for removal of wreck of barge Our Little Harry, lying in the Delaware River opposite the eastern end of League Island, opened January 20, 1897, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Poynter & Register, Lewes, Del	$640
2	Torrance & Idell, Camden, N. J	629
3	William H. Bookhammer, Lewes, Del	735
4	John L. Mills, Camden, N. J	627

Contract (dated January 28, 1897) entered into with John L. Mills.

Abstract of proposals for removal of wreck of schooner Lottie K. Friend, lying in the Delaware River near the foot of Bombay Hook Point Shoal, opened February 8, 1897, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Charles W. Johnston, Philadelphia, Pa	$1,340
2	John L. Mills, Camden, N. J	1,327
3	John Townsend, Somers Point, N. J	1,540
4	Gilbert M. Van Sant, Atlantic City, N. J	1,410
5	Poynter & Register, Lewes, Del	1,100

Contract (dated February 18, 1897) entered into with Thomas Poynter and Elijah D. Register. In progress.

CONTRACT IN FORCE, WITH NAME OF CONTRACTOR, DATE OF APPROVAL, OF BEGINNING WORK, AND EXPIRATION.

With Thomas Poynter and Elijah D. Register, of Lewes, Del., dated February 18 and approved February 27, 1897, for the removal of the wreck of the schooner *Lottie K. Friend.* To be commenced on or before February 25, 1897, and completed on or before April 25, 1897, which time was extended to July 25, 1897.

G 14.

PRELIMINARY EXAMINATION OF BARNEGAT BAY, NEW JERSEY, BETWEEN MANTOLING (MANTOLOKING) AND BAY HEAD.

[Printed in House Doc. No. 115, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated October 31, 1896, by Maj. Charles W. Raymond, Corps of Engineers, upon preliminary examination which the river and harbor act of June 3, 1896, directed to be made of Barnegat Bay, New Jersey, "between Mantoling [Mantoloking] and Bay Head."

Major Raymond is of the opinion that the waterway under examination is not worthy of improvement by the General Government. While the cost of improvement desired would be small, the conditions are not such, in my opinion, as to warrant the carrying out of such work at the expense of the United States.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., October 31, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report upon a preliminary examination of Barnegat Bay, New Jersey, between Mantoling and Bay Head, in accordance with a provision of the river and harbor act of June 3, 1896.

The name Mantoling is not found on any of the maps, but it is presumed that the point referred to is the small town of Mantoloking, which is on Barnegat Bay, 2½ miles south of Bay Head, and is shown on the accompanying sketch.*

This locality was examined under my direction during September, 1896, by First Lieut. Spencer Cosby, Corps of Engineers. The following extracts from his report, dated September 9, 1896, give full information concerning the character and commerce of the locality and the extent of the improvement desired:

Barnegat Bay itself is a shallow body of water extending along the eastern coast of New Jersey. The town of Bay Head is at its northern extremity, and at its other extremity, 20 miles or more to the south, it merges into a number of smaller bays and thoroughfares. It is of varying width, averaging, perhaps, 2 miles, and is separated from the Atlantic Ocean only by a long, narrow tongue of sand from 200 to 1,000 yards wide. Barnegat Inlet is the only break through this, and provides a navigable waterway from the bay to the ocean. At the southern extremity of the bay there is also a connection with the Atlantic through Little Egg Harbor and New Inlet, 22 miles south of Barnegat Inlet.

Oysters, clams, and fish of various kinds are found in the bay in great abundance and are fished for and transported by a large number of small sailing boats, few of

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*Not printed.

which draw over 4 feet of water. These boats also carry considerable quantities of hay and occasionally lumber, vegetables, and small quantities of other merchandise. This constitutes about all the commerce of the bay, though a large number of small pleasure craft also ply its waters.

That part of the bay covered by the present examination is the extreme northern part between Bay Head and the bridge which crosses from the mainland to Mantoloking. From this point to Barnegat Inlet there is a good channel for small boats with a least depth of 4 feet at mean low water. The bridge at Mantoloking has a draw 40 feet wide, with ample depth through it. From here to Herring Island, a mile to the north, the bay has a width of from one-fourth to one-half mile. There is a passage 100 yards wide on each side of the island, and then to Bay Head the bay is greatly widened by the Metedeconk River, which flows into it from the west.

* * * * * * *

The commercial interests of this locality, present and prospective, do not appear to be of sufficient magnitude to justify any expenditure for its improvement, especially as further expenditures for maintenance would doubtless be necessary in the future. I am therefore of the opinion that the waterway under examination is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

G 15.

PRELIMINARY EXAMINATION OF TUCKERTON CREEK, NEW JERSEY, AND FLATS AT MOUTH THEREOF.

[Printed in House Doc. No. 123, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated November 16, 1896, by Maj. Chas. W. Raymond, Corps of Engineers, giving the results of a preliminary examination of Tuckerton Creek and flats at mouth thereof, New Jersey, made to comply with the terms of the river and harbor act of June 3, 1896.

Major Raymond expresses the opinion that this stream is worthy of improvement by the General Government, and I concur with him to the extent of advising a survey, estimated to cost $400, upon the results of which a more reliable opinion can be formed as to the scope of the improvement justified by the commerce involved.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 16, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report upon a preliminary examination of Tuckerton Creek, New Jer-

sey, and flats at mouth thereof, in accordance with a provision of the river and harbor act of June 3, 1896.

This creek was examined under my direction in October, 1896, by First Lieut. Spencer Cosby, Corps of Engineers. Attention is respectfully invited to his report, dated November 4, 1896, a copy of which is transmitted herewith.

Tuckerton Creek flows into Little Egg Harbor. The head of navigation is at the town of Tuckerton, about 2 miles from the mouth. The range of the tide is from 2½ to 3 feet. The creek has an average width of about 75 feet and a least width of 50 feet. At Tuckerton there is a mean low-water depth of 15 inches, this being the minimum depth in the stream. The average depth is about 20 inches. It is reported that the depth was formerly much greater, but that shoaling has been in progress during recent years, due probably in part to sawdust from lumber mills which are now abandoned. At the mouth there is a depth of 4 feet, but the flats beyond it carry only from 2 to 2½ feet at low water. Beyond the flats there is a depth of from 6 to 10 feet to the ocean through New Inlet.

Tuckerton is a town of 1,400 inhabitants and has been a port of entry for over one hundred years, but has no longer any foreign commerce. The commercial interests of this town and the creek are fully described in Lieutenant Cosby's report. The principal industry is the oyster and clam trade, which is large and steadily increasing. During the year 1895 the oysters and clams brought up the creek and sent to market by rail amounted to 10,986,610 pounds, valued at $130,000. From 90 to 100 boats are now engaged in this trade. Large quantities of fish scrap, used in the manufacture of fertilizers, are shipped from this locality. Hay and produce are also shipped, and there is a small business in fishing and the construction of boats.

The improvement desired is the dredging of a channel from the upper landing in Tuckerton to Gaunts Point, a distance of 2¾ miles. It is proposed to give the channel a bottom width of 75 feet, a depth of 5 feet at mean low water from the upper landing to the lower landing, 400 yards below, and a depth of 6 feet at mean low water from the lower landing to Gaunts Point. It is said that this improvement will make it possible to use larger vessels in the oyster trade, as was done before the creek shoaled, and to construct ways for their repair; that the packing houses can be located higher up the stream; that vessels will not be detained while awaiting a favorable tide, and that steam communication between Tuckerton, Beach Haven, Atlantic City, and other points will be much facilitated.

In view of the benefits to commerce which would probably result from the work proposed, I am of the opinion that this creek is worthy of improvement by the General Government. The cost of a survey for the preparation of a project and estimate will not exceed $400.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. SPENCER COSBY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 4, 1896.

SIR: In compliance with your instructions, I have the honor to submit the following report of a preliminary examination of Tuckerton Creek, New Jersey, and flats at mouth thereof.

Tuckerton Creek is a small stream 2 miles long, flowing into Little Egg Harbor on the New Jersey coast. Its head is at a milldam which separates it from a small body of water near the town of Tuckerton, known as Lake Pohatcong. The creek drains a territory comprising an area of 11.9 square miles above the pond and has an estimated minimum daily fresh-water discharge of 2,000,000 gallons.

It is similar in character to the many streams which flow into the landlocked bays and harbors along this part of the Atlantic Coast. It is tidal throughout its length, the ordinary rise of tide being from 2½ to 3 feet. It pursues its way with many turns through the surrounding flat salt-water marshes, whose level is but little above that of high water. Its course, however, is more direct and its turns less abrupt than in the majority of the neighboring streams. The banks are of a tough mud held well together by the roots of the marsh grass and showing little evidences of caving in. The bottom is principally of mud, though for about 400 yards in the upper reach it is overlaid by a coating of sand. Considerable sawdust is also met with along the creek, into which it found its way from lumber mills which formerly stood near the head of the stream, but were abandoned five or six years ago. The creek has an average width of about 75 feet and a least width of 50 feet. At Tuckerton, at the head of navigation, there is a mean low-water depth of 15 inches. This is the minimum depth found in the stream, the average to the mouth being about 20 inches. Twenty or thirty years ago it is said to have been at least double this, but gradual shoaling has taken place, due probably in part to the inroads of sawdust from the mills. At the mouth itself there is a depth of 4 feet, though immediately beyond are the flats carrying from 2 to 2½ feet at low water. The natural flow of the ebb and flood tides from the mouth seems to be along the north shore to "Gaunts Point," three-fourths of a mile distant, where a depth of 6 feet is found. This soon increases to 10 feet as we leave the shore, and this depth can be carried to deep water in the ocean through New Inlet, one of the best along the New Jersey coast.

Tuckerton, at the head of the creek, is a town of 1,400 inhabitants, and has been a port of entry for over one hundred years, though it has no longer any foreign commerce. It is the terminus of the Tuckerton Railroad, which makes direct connection with both New York and Philadelphia. Tuckerton formerly did quite a large shipbuilding business. Some 60 vessels, of from 50 to 500 tons burden, were built during the twenty years before 1882, when the business was abandoned, partly because of the shoaling of the creek, but partly also because of the decrease in the supply of lumber. Small boats, however, are still built, and one of the objects of the desired improvement is to render possible the construction of ways for repairing vessels. The principal industry of Tuckerton is the oyster and clam trade, which is large and steadily increasing in amount. Little Egg Harbor and the neighboring waters teem with oysters and clams, and Tuckerton is the most convenient point through which they can reach the markets. Between 90 and 100 boats, of from 6 to 40 tons capacity and having a maximum draft when loaded of 6 feet, are now engaged in this trade. Formerly, vessels of 75 and even 100 tons burden are said to have been employed, but the increasing shallowness of the creek led to their disuse.

The business is an all the year round one. All the boats bring their cargoes to packing houses situated along the banks of the creek, whence they are carried in wagons to the railroad station at Tuckerton. The lack of depth has caused some of these houses to be built on the lower part of the creek, thus increasing the length and cost of the haul. The oyster boats have to wait for a favorable state of the tide to ascend the creek, sometimes during the prevalence of a northwest wind for days, and even then frequently run aground. These delays of course cause financial losses. The business, it is claimed, would also be rendered more profitable if the depth of water permitted larger vessels to be used. During the year 1895 the oysters and clams brought up Tuckerton Creek and shipped over the railroad amounted to 10,986,610 pounds, valued at $130,000. More oysters are now planted than ever before, and it is estimated that the business is growing in value at the rate of $25,000 a year.

A small fishing business is also done, to the value, perhaps, of $3,000 a year. Then there are two menhaden fish factories on islands near Little Egg Harbor which produce large quantities of oil. This is shipped to New York in vessels which could go up the creek if the depth was sufficient. As it is, large quantities of the fish scrap, used in the manufacture of fertilizers, are shipped from the factories over the creek and the railroad from Tuckerton. The amount so shipped in 1895 was 1,130,093 pounds. The extensive meadows along the shores of Little Egg Harbor, Great Bay, and Tuckerton Bay produce quantities of hay. The facilities for getting this to market are poor and much of it is allowed to go to waste. Still, some is now shipped to Tuckerton, and it is believed that the quantity would be increased if the creek were improved. A small steamer was used for several years in the transportation of hay. Six years ago it was given up, as it could get to Tuckerton only at high tide, and not always then, and the hay had to be shipped by rail. During the summer and fall garden produce from the surrounding country is brought into

Tuckerton and shipped in a boat which runs daily to Beach Haven, a summer resort on the opposite side of Little Egg Harbor. When the tide is unfavorable—i. e., every other week—the boat can not use the creek, and the wagons have an extra haul of a mile over the soft meadow road. It is nearly 20 miles by rail to Beach Haven; but only 7 by water. Last summer an attempt was made to run a passenger steamer drawing 30 inches between Tuckerton and Beach Haven. It was found impossible to make the sailings with the requisite degree of regularity and the experiment proved a loss, so that it is doubtful whether it will be repeated while the creek remains in its present condition. If this is improved it is proposed to run a steamer to Atlantic City.

The improvement desired in Tuckerton Creek is the dredging of a channel having a low-water depth of 5 feet from the upper landing in the town to the lower landing, 400 yards below, and from there to Gaunts Point of a channel 6 feet deep at mean low water, each having a bottom width of 75 feet. The banks of the creek have remained nearly the same for years, and the extent of shoaling is said to have been slight during the past few years, so that a dredged channel would be likely to fill up only gradually. The channel along the shore from the mouth of the creek to Gaunts Point would have the advantage of not interfering with any oyster grounds. Little damage is to be feared from ice, as it is claimed that it does not stop navigation in the harbor more than once every three or four years on an average, and then but for a day or two.

In view of the extent of the commerce now carried on on this stream, and of the benefits which would accrue to it from increased facilities in navigation, I am of the opinion that Tuckerton Creek is worthy of improvement by the General Government.

The cost of a survey for the preparation of a project for improvement is estimated at $400.

Very respectfully, your obedient servant,

SPENCER COSBY,
First Lieutenant, Corps of Engineers.

Maj. C. W. RAYMOND,
Corps of Engineers, U. S. A.

G 16.

PRELIMINARY EXAMINATION OF WADING RIVER, NEW JERSEY.

[Printed in House Doc. No. 94, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated November 6, 1896, by Maj. Charles W. Raymond, Corps of Engineers, giving the results of a preliminary examination of Wading River, New Jersey, provided for by the river and harbor act of June 3, 1896.

It is the opinion of Major Raymond, in which I concur, that Wading River is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 6, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report of a preliminary examination of Wading River, New Jersey, in accordance with a provision of the river and harbor act of June 3, 1896.

This river was examined under my direction in October, 1896, by First Lieut. Spencer Cosby, Corps of Engineers. Attention is respectfully invited to his report, dated November 4, 1896, a copy of which is transmitted herewith.

Wading River is a tributary of Mullica River, entering the latter at a point about 8 miles above its mouth. Mullica River flows into Great Bay and communicates with the ocean through New Inlet. Its channel depth is 20 feet or more, but through Great Bay to New Inlet the depth is not much over 4 feet at low water.

Wading River is navigable, by boats which can navigate the bay, for a distance of 5 miles above its mouth. For 2 miles farther there is a 4-foot channel, and then there are found numerous sand bars, some almost bare at low water. The surrounding country is sparsely settled and the land is sandy and unproductive. Cedar trees are found in the swamps, and pines and oaks in the uplands At Harrisville, 8½ miles above the mouth, there was a paper mill which has recently suspended operations.

Vessels now ascend the river to Wading River post-office, a distance of about 5 miles, where they receive wood brought in scows and wagons. Little produce seems to be shipped from this point, although the facilities for shipping are good.

The improvement desired is the prolongation of the 4-foot channel by dredging through the shoals to Harrisville. It is claimed that this would enable the people to get their produce to market more easily, as the nearest railroad points are Tuckerton and Egg Harbor, both over 10 miles from Harrisville.

The present or prospective benefits to commerce which would result from the proposed improvement do not appear to be sufficient to justify its execution. I am therefore of the opinion that this river is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. GRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. SPENCER COSBY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 4, 1896.

SIR: I have the honor to submit the following report of a preliminary examination of Wading River, New Jersey, made in compliance with your instructions.

Much of the following information has been derived from the report of the State survey of New Jersey.

Wading River is a stream 22 miles long, flowing in a southerly direction into Mullica River, the largest stream of the Atlantic Coast group. This latter river flows into Great Bay, and is tidal and navigable for 20 miles, pursuing a very sinuous course. Through Great Bay to New Inlet the channel depth is not much over 4 feet at low water, but this increases in the river to 20 feet or more. Wading River flows into it 8 miles above the mouth, though only half as much in a direct line. It is tidal and navigable by any boats that can navigate the bay as far as Wading River post-office, 5 miles above its junction with Mullica River. Here there is a highway bridge having a draw span about 35 feet wide. For a couple of miles farther there is a 4-foot channel, and then there are found numerous bars of sand, some almost bare at low water.

Just below Harrisville, 4½ miles above Wading River post-office, the river divides into two parts, one known as the East Branch and the other as the West Branch.

The lower part of Wading River is bordered by tide marsh; the upper part is bordered largely by cedar swamps, though these are disposed more in compact and isolated areas than in a regular strip along the stream. The total area drained by the river amounts to 189 square miles, and the estimated minimum daily flow through its two branches is 27.6 million gallons. The surrounding country is sparsely settled, the average population being about 7 per square mile. The ground is sandy and unproductive—less than 2 per cent is cleared land. Cedar trees are found in the swamps, and a rather sparse growth of pines and oaks in the uplands; valuable cranberry bogs are under cultivation upon some of the cedar-swamp bottoms. At Harrisville there was a paper mill, which has recently suspended operations, and most of the people have now left the town.

The improvement desired is the prolongation of the 4-foot channel by dredging through the shoals to Harrisville. This, it is claimed, would enable the people to get their produce more easily to market, as the nearest railroad points are Tuckerton and Egg Harbor, both over 10 miles from Harrisville. Considering the nature of the country and its state of cultivation, it does not seem that the amount of produce so shipped would amount to very much. Vessels now come up as far as Wading River post-office (formerly called Bridgeport), where they are loaded with wood brought there in scows and in wagons. This is the only present commerce that I could discover. Apparently little produce is now shipped even from this point, where the facilities are good. If the factory were to start again at Harrisville the improvement of the river would be of advantage to it. There are several other points on the East and West branches where good water power is available, but none, I believe, are in use.

Until the resources of the surrounding country are more developed it does not appear that the improvement of Wading River would be of sufficient general advantage to commerce to justify the expenditure of any money on it by the United States.

Very respectfully, your obedient servant,

SPENCER COSBY,
First Lieutenant, Corps of Engineers.

Maj. C. W. RAYMOND,
Corps of Engineers, U. S. A.

G 17.

PRELIMINARY EXAMINATION OF BEACH THOROUGHFARE, NEW JERSEY, AT AND NEAR THE MEETING OF TIDES FROM ABSECON AND EGG HARBOR INLET.

[Printed in House Doc. No. 51, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated October 28, 1896, by Maj. Chas. W. Raymond, Corps of Engineers, of the results of a preliminary examination of Beach Thoroughfare at and near the meeting of tides from Absecon and Egg Harbor Inlet, New Jersey, made to comply with requirements of the river and harbor act of June 3, 1896.

It is the opinion of Major Raymond, concurred in by me, that this waterway is worthy of improvement by the General Government.

No survey will be necessary to the preparation of plan and estimate of cost of work proposed.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., October 28, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report of a preliminary examination of Beach Thoroughfare, New Jersey, at and near the meeting of tides from Absecon and Egg Harbor Inlet, in accordance with a provision of the river and harbor act of June 3, 1896.

This thoroughfare was examined, under my direction, in September, 1896, by First Lieut. Spencer Cosby, Corps of Engineers. Attention is respectfully invited to his report, dated September 21, 1896, a copy of which is transmitted herewith.

This thoroughfare connects Egg Harbor Inlet with Absecon Inlet. It is used principally during the summer by a large number of small boats carrying great quantities of supplies of various kinds to Atlantic City and other points along the coast. It furnishes good navigation for these vessels at all stages of the tide, except for a distance of about 2 miles, where it is narrow and shallow and can only be navigated at high water.

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In view of the large traffic which would be benefited at a moderate cost by the proposed work, I am of the opinion that this waterway is worthy of improvement by the General Government.

This locality having been surveyed in detail in 1887, under the direction of Col. Henry M. Robert, Corps of Engineers, no further survey will be required.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. SPENCER COSBY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., September 21, 1896

MAJOR: In compliance with your instructions, I have the honor to submit the following report of a preliminary examination of Beach Thoroughfare at and near the meeting of tides from Absecon and Egg Harbor Inlet.

A complete survey "of the thoroughfare running back of the ocean from Cape May to the Great Bay north of Atlantic City, N. J.," was made in 1887 under the direction of Col. Henry M. Robert, of the Corps of Engineers; the report of this survey is contained in the Annual Report of the Chief of Engineers for 1888. To this report and the maps accompanying it I am indebted for most of the following facts and figures: Beach Thoroughfare was included in the survey and from what I have been able to ascertain there have been few changes in this thoroughfare during the past nine years.

The New Jersey coast from Cape May to Great Bay consists of a low, flat salt-marsh meadow from 2 to 6 miles wide, behind which rises the higher ground of the mainland proper. The surface of the marsh is only 4 or 5 feet above mean low water and is covered by the high water of storm tides. This marsh area is indented by numerous bays and sounds which connect with the ocean through "inlets" and are connected with one another by winding passages known as "thoroughfares."

The land areas immediately along the coast line and at the inlets are composed of drifting sand, and the configuration of the bars at the mouths of the inlets materially changes with each violent gale. Directly behind the sand border of the coast

lie the salt marshes traversed by the waterways under consideration. The land areas of these marshes consist of a tough black soil, apparently the result of slow deposits and vegetable growth, closely knit together with the roots of the marsh grass. The shore lines of the waterways rise with a nearly vertical face from 1 to 2 feet above mean high water, and present surfaces quite easily eroded by currents and storms. The banks are thickly perforated with the holes of sand fiddlers and crawfish, and through their action a slow disintegration of the banks is constantly in progress. The beds of the water areas consist of mud, except in the vicinity of the inlets where sand is found. I doubt whether this mud bottom is of very great depth; in Beach Thoroughfare I was assured by some of the boatmen of the locality that it is not more than a foot thick, and that below it sand is invariably found.

The mean range of the tide along this part of the coast is about 4 feet, and the ebb and flood through the inlets produce a corresponding change in the heights of water in the inland water areas. As the flood tide enters the inlets it passes inland by the various connecting waterways to the right and left. As a result there is a point of meeting in these inland waterways of the flood coming from adjacent inlets, and consequently at such points of meeting of the tide there exists only a vertical movement of the tidal wave. The exact point of meeting of the tides depends upon the direction of the wind. On account of the absence of tidal currents at the meeting of the tides there ensues a slow deposition of the material held in suspension, and, as would naturally be expected, the water is very shallow over the area covered by these points of meeting. Such a shallow area in the inland waters exists between each successive pair of inlets, and it is this area in Beach Thoroughfare, between Egg Harbor Inlet and Absecon Inlet, that is covered by the present examination.

Beach Thoroughfare extends in a general northeasterly direction from Risleys Channel—through which it connects with Great Egg Harbor and Egg Harbor Inlet—to Absecon Inlet. Egg Harbor Inlet is considered one of the best along the coast, and safer and with a greater depth than Absecon Inlet. Risleys Channel is 2 miles long from the inlet to the beginning of Beach Thoroughfare proper, and through this 2 miles there is an excellent channel with a least depth of 12 feet at mean low water. The thoroughfare pursues a tortuous course through the flat marsh meadows; its width varies from 400 to 1,000 feet, and it has a length of nearly 7 miles from its beginning to Atlantic City. For the first 2 miles there is a good 12-foot channel with depths in places as great as 29 feet. For the next 2 miles there is a 6-foot channel having an average width of 1(0 feet and a least width of about 60 feet. For a few hundred yards farther on there is a narrow 4-foot channel, and then for the next mile there is no channel through the thoroughfare. This shoal area is the place of the meeting of the tides from the two inlets. Through it the thoroughfare has a width of from 400 to 800 feet with depths ranging from 0 to 1½ feet. Beyond this shoal area a good 6-foot channel is found to Atlantic City with an average width of 100 feet and a least width of 75 feet.

The majority of the boats which now use this thoroughfare are small sailboats drawing from 1 to 4 feet. During the summer months they pass through it in large numbers, carrying to Atlantic City "truck"—vegetables, fruit, poultry, eggs, clams, oysters, hay, etc.—from Great Egg Harbor, the Tuckahoe River, and points farther south along the New Jersey coast. Atlantic City has now a large permanent population, and during the summer it is one of the most crowded of resorts, and furnishes a splendid market for this "truck." Some of the boats engaged in this trade come from as far south as Chincoteague, Va. All these boats can cross the long shoal in Beach Thoroughfare—at extreme low tides it is sometimes entirely bare—only at high water. They frequently run aground, or missing one high water have to wait until the next, a delay sufficient often to ruin their perishable cargo or to cause it to arrive too late for the market. This trade appears to be confined almost entirely to the summer months. I found it impossible to obtain any reliable information as to the number of boats engaged in it or the value of their cargoes.

Colonel Robert, in his report of his survey, makes particular mention of this part of the system of inland navigation: "The dredging of 114,000 cubic yards from 2 miles of channel (i. e., Beach Thoroughfare) would connect the Tuckahoe River with Atlantic City by a good 6-foot channel at low water, which would prove a great benefit to those living on that river." Not only would the dredging of a channel through this shoal benefit and probably greatly stimulate the navigation of this locality, but, if the project of Colonel Robert is ever carried out, it will form one link in the series of 6-foot channels which are to connect the inland waterways from Cape May to Great Bay. This, too, is apparently the point at which it was intended to begin work under Colonel Robert's project. As a survey has already been made it would not be necessary to make another for this improvement. Colonel Robert states:

"In estimating the amount of dredging I have taken 6 feet as the depth to be maintained at low water, and have had the calculations all made to 7 feet depth in order to secure the proper depth. The width at this depth of 7 feet is taken at 50

feet and the side slopes at 1 vertical to 3 horizontal, so that the width at 3 feet below low water would be 74 feet. * * * The quantity of material has been reduced to scow measurement by adding 20 per cent to place measurement, because in practice it probably would be measured either in the dipper or in scows. It does not seem to me that a greater width than 50 feet at 6 feet below low water is necessary in the dredged channel." * * *

Very respectfully, your obedient servant,

SPENCER COSBY,
First Lieutenant, Corps of Engineers.

Maj. C. W. RAYMOND,
Corps of Engineers, U. S. A.

G 18.

PRELIMINARY EXAMINATION OF OLDMANS CREEK, NEW JERSEY.

[Printed in House Doc. No. 120, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated November 16, 1896, by Maj. Charles W. Raymond, Corps of Engineers, giving the results of a preliminary examination of Oldmans Creek, New Jersey, authorized by the river and harbor act of June 3, 1896.

Major Raymond states that in his judgment this stream is worthy of improvement by the General Government, and I concur in this opinion to the extent of advising a survey, estimated to cost $500, upon the results of which a more reliable opinion can be formed as to the scope of the improvement justified by the commerce involved.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 16, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report upon a preliminary examination of Oldmans Creek, New Jersey, in accordance with a provision of the river and harbor act of June 3, 1896.

This creek rises in Gloucester County, flows in a northwesterly direction, and enters the Delaware River about 3½ miles below a point opposite Marcushook, Pa. The head of navigation is at Auburn, where the stream is crossed by a highway bridge without a draw. At this point the width is 60 feet and the low-water depth 2 to 3 feet. Above Auburn the waterway rapidly decreases in width and depth, and

becomes at Harrisonville, 2½ miles from Auburn by road, a mere brook, so obstructed by fallen trees and timber as to make its passage even by a rowboat impracticable.

From Auburn the stream winds through a valley, alternating between the fast land on either side, has numerous short bends, and gradually deepens and widens until at Pedricktown, about 12 miles below, it has a width of 115 feet and a low-water depth of 6 to 8 feet.

The valley through which it flows has at Auburn a width approximating 600 feet, with high banks; this valley gradually widens and the banks decrease in height until at Pedricktown the stream leaves the fast land entirely, and thence to the mouth, about 5 miles, runs through open meadows, lying 2 to 3 feet below high water, largely under cultivation and protected from overflow by meadow banks which extend well up toward Auburn.

Below Pedricktown the stream widens to from 200 to 300 feet.

The prevailing low-water depths are, except on the bar and the shoals hereafter noted, 3 to 8 feet from Auburn to Pedricktown, and thence to the mouth, 5 to 10 feet. The average rise and fall of tides are: At Auburn, 3½ feet (estimated); at Pedricktown, 5½ feet (estimated); at the bar, 6 feet (estimated).

The bottom is usually mud and sand with occasional gravel ridges. The only tributary of consequence is Beaver Creek, between Auburn and Pedricktown.

The stream is crossed by bridges as follows:

Kind of bridge.	Locality.	Length.	Clear bay of draw-span.
		Feet.	*Feet.*
Highway	Auburn	60	None.
Do	Pedricktown	100	30
Railroad	1½ miles below Pedricktown		*a* 42
Highway	3½ miles below Pedricktown	200	34

a Measured on line of railroad. Not at right angles to creek.

The high-water clearances vary from nothing at the railroad bridge, where the bottom of the draw truss is in the water, to about 4 feet at Pedricktown.

The principal obstructions to navigation are—

1. From Auburn to Pedricktown, six shoals, as follows, viz:

At Weatherbys or Currys Bar (formerly Horners) 1 mile below Auburn, a sand bar carrying 2½ feet at low water and having an estimated length of 200 feet. This bar was dredged many years ago by private parties.

At Englands Landing, about 1¾ miles below Auburn. This shoal is about the same as at Currys, except that it is composed of gravel and has a large rock in the center of the channel.

At Lynchs, or Lanes, there is a gravel bar approximating 200 feet in length, through which is a very narrow channel. Tugs can often pass this shoal, while loaded scows 21 feet wide, having the same draft as the tug, ground.

The "Grave Yard," about 8 miles below Auburn. This is a gravel bar, estimated at 300 yards in length, which narrows the channel and reduces the available low-water depth to 2½ feet. This shoal is below a sharp bend which throws passing steamers on the bar.

At Weatherbys Lower Landing, 1 mile above Pedricktown, is a gravel bar carrying 3 feet at low water, with a length stated at 200 feet.

In the first reach above Pedricktown there is a gravel shoal, estimated as 150 feet long, carrying 3 feet at low water.

2. Between Pedricktown and the mouth the obstructions are Pine Island and Hampton Shoals (both gravel ridges), a mud flat between Pedricktown and the railroad bridge, a shoal below the railroad bridge, and the bar at the mouth.

On the above shoals the depths vary from 2 to 3 feet. Their lengths vary from 50 to 150 yards.

On the bar the low-water depth varies between 2 and 3 feet, the channel following the New Jersey shore. The distance by the present channel between the 6-foot contour in the creek and the corresponding contour in the Delaware is about 1 mile. The creek's entrance into the river is a peculiar one, the channel running nearly parallel to the river for fully a mile and being separated from it by a low bar. The distance across this bar between the 6-foot contours is about 1,500 feet.

For purposes of commerce, the river is naturally divided into two sections, (1) from Pedricktown to the mouth, (2) from Auburn to Pedricktown.

Pedricktown is located about 5 miles above the mouth in the midst of a rich agricultural country, has a population of 800, one large grist-mill, and the variety of general stores, blacksmith shops, etc., usual to a town of its size. It exports flour, feed, and produce, and imports coal, hay, manure, shells, lumber, and general merchandise.

Auburn has a population of 100, no factories, maintains 3 general stores, and derives its importance as a shipping point from the truck farms by which it is surrounded, these depending largely upon water transportation to Philadelphia, Chester, and Wilmington for a market. It exports truck, and imports coal, lumber, manure, and merchandise. Besides these principal points there are 13 farm landings.

From Auburn down commerce is carried on by a tug towing 2 scows with a capacity of 70 tons each, making 3 round trips weekly to Philadelphia during the trucking season, from July 15 to October 15 (at other seasons 2 round trips weekly), and the steam barge *Elsie Weatherby*, capacity 100 tons, towing 1 barge (capacity 70 tons), making 3 round trips during trucking season and running irregularly at other times. Besides these, there are other boats making 15 to 20 trips in and out during the trucking season, and occasionally schooners come up with salt hay. The *Weatherby* has a draft of $5\frac{1}{2}$ to 6 feet, the tug 5 feet, and the loaded barges 5 to 6 feet. They work on the tide, leaving before high water so as to reach Pine Island and the bar at as nearly high water as possible.

From Pedricktown a tug and scow (capacity 150 tons) make 3 round trips to Philadelphia per week during trucking season, 1 steamer of 100 tons makes 3 round trips to Philadelphia during same season, and 1 steamer, *Mary E. Justice*, 70 tons, runs to Philadelphia, Wilmington, Chester, and other points all the year. These boats have a draft of from 5 to 6 feet. Besides these, there is an irregular commerce consisting of truck boats, canal boats, in tow of tugs, small schooners, etc., bringing in hay, manure, and shells, and taking out produce; canal boats, loaded, draw from 7 to 8 feet.

Boats leave Pedricktown about two hours before high water so as to cross Pine Island and the bar on the top of the tide. This necessitates stemming the tide to Philadelphia.

The annual water commerce is estimated as follows:

Pedricktown to the mouth.—One hundred and sixteen steam and 117 sail vessels and barges; 22,875 tons of freight, valued at $242,545.

Auburn to the mouth.—One hundred and sixty steam and 200 sail vessels and barges; 18,745 tons of freight, valued at $115,709.

Summary.—Two hundred and seventy-six steam and 317 sail vessels and barges; 41,620 tons of freight, valued at $358,254.

The improvement asked for by shippers is the formation of a channel at least 6 feet deep and 100 feet wide across the bar, and the dredging of a similar channel 80 feet wide through the shoals as far up as Pedricktown; above Pedricktown the dredging of a channel 40 feet wide and 5 feet deep where needed.

The bar, Pine Island, and Hampton Shoals are the worst obstructions. Their removal would benefit the whole river, enabling shipments of perishable articles to be made without regard to tide, and would probably immediately increase the present water commerce from 30 to 50 per cent by diversion from the railroads.

The commercial interests which would be benefited by improving the stream are at present largely agricultural; manufacturers are barred off the stream on account of the poor entrance.

Full commercial statistics for the year ending October 1, 1896, compiled from statements submitted by leading shippers and merchants, are appended to this report.

In my opinion, this creek is worthy of improvement by the General Government. The cost of a survey for the purpose of preparing a plan and estimate for its improvement is estimated at $500.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

COMMERCIAL STATISTICS OF OLDMANS CREEK, NEW JERSEY, FOR THE YEAR ENDING OCTOBER 1, 1896.

Vessel statement.

Kind of vessel.	Number.	Tonnage.	Arriving.	Departing.
Pedricktown to mouth:				
Steamers	116	18,700	116	116
Sailing vessels	47	700	47	47
Barges and canal boats	70	4,900	70	70
Auburn to mouth:				
Steamers	160	9,000	160	160
Sailing vessels	20	200	20	20
Barges and canal boats	180	12,500	180	180
Totals:				
Steamers	276	27,700	276	276
Sailing vessels	67	900	67	67
Barges and canal boats	250	17,400	250	250
Aggregate	593	46,000	593	593

Freight statement.

Articles.	Arriving.		Departing.	
	Tons.	Value.	Tons.	Value.
Pedricktown to mouth:				
Manure	7,450	$13,410	.....	.....
Coal	1,100	5,500	.....	.....
Lumber	375	9,375	.....	.....
Grain	1,400	33,600	.....	.....
Salt hay	200	1,000	.....	.....
General merchandise	300	30,000	.....	.....
Truck, baskets	.....	.....	8,000	$64,000
Truck, barrels	.....	.....	50	400
Melons	.....	.....	2,200	17,600
Hay	100	1,500	.....	.....
Flour Feed	.....	.....	1,400	56,000
Shells	200	160	.....	.....
Miscellaneous	100	10,000	.....	.....
Total	11,225	104,545	11,650	138,000
Auburn to mouth:				
Manure	6,880	12,384	.....	.....
Lumber	75	1,875	.....	.....
Coal	450	2,250	.....	.....
General merchandise	90	9,000	.....	.....
Truck, baskets	.....	.....	8,000	64,000
Truck, barrels	.....	.....	150	1,200
Melons	.....	.....	3,000	24,000
Miscellaneous	.....	.....	100	1,000
Total	7,495	25,509	11,250	90,200

Total commerce.

	Arriving.		Departing.	
	Tons.	Value.	Tons.	Value.
From Pedricktown	11,225	$104,545	11,650	$138,000
From Auburn	7,495	25,509	11,250	90,200
Total	18,720	130,054	22,900	228,200

	Tons.	Value.
Arriving	18,720	$130,054
Departing	22,900	228,200
Total	41,620	358,254

G 19.

PRELIMINARY EXAMINATION OF DIVIDING CREEK, NEW JERSEY.

[Printed in House Doc. No. 93, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of November 7, 1896, by Maj. Charles W. Raymond, Corps of Engineers, giving the results of the preliminary examination of Dividing Creek, New Jersey, authorized by the river and harbor act of June 3, 1896.

Major Raymond reports that the benefits to commerce which would result from the improvements desired would doubtless be sufficient to

justify their very moderate cost, and in his opinion this stream is worthy of improvement by the General Government.

I concur in the views of the district officer to the extent of advising a survey of Dividing Creek, estimated to cost $150, upon the results of which a more reliable opinion can be formed as to the extent of the improvement justified by the commerce involved.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 7, 1896.

GENERAL: In compliance with instructions contained in Department letter dated June 16, 1896, I have the honor to submit the following report upon an examination of Dividing Creek, New Jersey, in accordance with a provision of the river and harbor act of June 3, 1896.

This creek rises in the northeast part of Cumberland County in two branches, which unite just above the town of Dividing Creek. From the point of junction the stream follows a tortuous course, in a general southerly direction, for a distance of about 4½ miles, entering Delaware Bay 3 miles northeast from Egg Island Light-House. The length of the creek from the forks to its mouth, following all its sinuosities, is about 9½ miles, or more than twice the distance measured in a direct line. It has three large tributaries—Florida Creek, Ogden Creek, and Hands Creek—which enter it at points 3 miles, 4½ miles, and 4¾ miles, respectively, from its mouth.

The creek is spanned by a fixed, covered bridge at the turn below the forks, and navigation above this place is consequently impossible, although there is a sufficient depth of water. It is bordered throughout its length by salt meadows having a general elevation slightly above high water. The banks are usually quite steep and the depth is nearly uniform over the whole width of the cross section, except in certain bends where there are shoals protruding from the points. The bed of the creek is composed of mud, except in one or two places where there is sand or gravel. The ruling depth is 10 feet, and the least depth 3.5 feet at mean low water. The least depth over the bar at the mouth is 3 to 3.5 feet at mean low water.

Two canals or cuts have been dug by local vessel owners across narrow necks of land between recurring reaches of the creek. The lower one, a short distance above Hands Creek, is 50 feet long and 20 feet wide, avoiding one-third mile of the natural course, and was made in 1864. The upper one, situated just below the confluence of Maple Creek with the main stream, is 30 feet long and 15 feet wide, obviates over one-half mile of winding, and was made in 1880.

The mean rise and fall of the tides at the mouth of Dividing Creek is 5.6 feet and at the bridge 3.5 feet. The difference in time of high water at these two places is one hour twenty minutes, and of low water one hour fifty minutes. High water at the mouth occurs fifteen minutes earlier than at Mahons River, Delaware.

The town of Dividing Creek contains about 780 inhabitants, the greater part of whom are vessel owners, oystermen, and fishermen. Thirty to forty sloops and schooners from 40 to 50 feet long, 10 feet beam, drawing 4 feet of water and registering from 6 to 27 tons, belong to this port. Occasionally a schooner of 6 feet draft comes up to the bridge. Formerly the fleet was much larger, but owing to superior facilities at Port Norris many of the boats have been diverted to that place.

The articles most often brought to Dividing Creek are gas lime, coal, grain, salt hay, and the general supplies; the bulk of these, however, come by rail, since the great length of the creek and the difficulty of navigating its many bends make the rates by water prohibitive. In the past year from 400 to 500 tons of coal, valued at $7 per ton; 500 tons of salt hay, at $5 per ton; 8,000 bushels of corn, at 40 cents per bushel, and 100 tons of gas lime were brought to Dividing Creek partly by water but chiefly by rail. Goods conveyed by rail have to be carted from the railroad station 2½ miles distant. During 1895–96 three sloops, conveying salt hay for use upon neighboring farms, made 40 trips from the lower waters of the creek to the bridge, the amounts transported aggregating 500 tons. Corn is brought regularly by two or three schooners, and three loads of coal (total 100 tons) were conveyed by water last year.

The principal exports from Dividing Creek are cord wood and salt hay. Of the latter, 2,000 to 2,500 tons are cut annually from the meadows bordering the creek and its tributaries. This hay, valued at from $5 to $6 per ton, is shipped chiefly to Philadelphia, although last year one schooner of 80 tons burden made regular trips from Hands Creek to Millville, carrying a total of 800 tons. Berries and watermelons are sent to Philadelphia. Last year 10 loads of cord wood of 25 cords each, valued at $3 per cord, were sent to Point Breeze. Ice is sometimes shipped, but is usually carted to Port Norris.

The principal industries of Dividing Creek are ship-timber forming and basket making. There are two sawmills, the annual output in ship frames from each of which is from 150,000 to 200,000 feet, B. M. This timber is valued at $35 per 1,000 feet. A considerable trade is also done in general lumber. The basket factory has an annual product of about 150,000 baskets, worth from $50 to $60 per 1,000. All the timber for these mills is cut in neighboring forests. There is also a gristmill which runs two or three days each week.

A small shipyard, with a railway, is located on the east side of the creek just below the bridge, but no boats have been built there during the past five years. Vessels, however, often come here to be hauled out, and the number of these would be much increased were the stream more easily navigable. A total of 30 boats was docked last year.

The improvement desired by all the vessel owners of Dividing Creek is not an increase in depth, for that is already sufficient for the needs of navigation, but a straightening of the course of the stream by digging canals across several narrow necks of land between recurring reaches, and a widening of the existing cuts.

The cuts proposed will avoid reaches in which shoals occur, as well as bends the most difficult to turn. The aggregate length of the five cuts is about 2,550 feet. The amount of material which it would be necessary to excavate would be about 28,000 cubic yards, measured in place, which could be thrown upon the adjacent meadows. It is understood that the necessary land and permission to deposit material on the banks can be obtained without expense to the Government. By the construction of these canals the creek would be shortened nearly 4

miles, and the distance between the bridge and the mouth would be reduced from 9¼ to 5½ miles.

With these improvements it is believed by the citizens of Dividing Creek their commerce would be much increased. General supplies would be brought by water, because of the relative inaccessibility of the railroad. Oyster boats would obtain their stakes, thousands of which are used annually upon the oyster beds, from the woods around Dividing Creek and their provisions from the town. Coal and grain and the products of the saw and basket mills would be shipped by water. It is claimed also that other industries, such as glass blowing and canning, unprofitable now because of the cost of obtaining material, would spring into existence, and more boats would find a harbor at Dividing Creek and come to its shipyard for repairs.

The benefits to commerce which would result from these improvements would doubtless be sufficient to justify their very moderate cost. I am of the opinion that this creek is worthy of improvement by the General Government.

The cost of the survey required for the preparation of a plan and estimate will not exceed $150.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

G 20.

SURVEY OF SALEM RIVER FROM ITS MOUTH TO SALEM CITY, NEW JERSEY.

[Printed in House Doc. No. 78, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., July 6, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated June 29, 1897, by Maj. C. W. Raymond, Corps of Engineers, giving the results of a survey of Salem River from its mouth to Salem City, N. J., made in compliance with the provisions of the river and harbor act of June 3, 1896.

The project of improvement presented contemplates the formation, by dredging, of a channel 100 feet wide and 9 feet deep at mean low water, amplifying at the bends so as to permit the passage of vessels 200 feet long from the Delaware River up to the highway bridge over Little Salem Creek, including the removal of the stony bars in front of the city wharves and at the bend above the brickyard. The cost of the work proposed is estimated at $31,500.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., June 29, 1897.

GENERAL: In compliance with instructions contained in Department letter dated September 5, 1896, I have the honor to submit herewith a copy of a report of Mr. R. G. Pearson, United States surveyor, dated March 11, 1897, upon a survey of Salem River, New Jersey, from its mouth to Salem City, made under my direction in accordance with a provision in the river and harbor act of June 3, 1896. The results of the survey are shown on the accompanying tracing.*

This stream enters the Delaware River about 4 miles below Fort Delaware. Salem City is situated about 3 miles above the mouth. At this point the river has a width of 500 feet, increasing to 1,500 feet at the mouth. There are several large bends between Salem City and the mouth of the river. Little Salem Creek enters the river about 3 miles above its mouth. The head of navigation is at the bridge crossing Little Salem Creek, about eight-tenths of a mile above its entrance into the main river.

The present condition of the channel of the river from the mouth to Salem City is described in detail in Mr. Pearson's report and shown upon the accompanying tracing. The improvement desired is the formation of a channel 100 feet wide and 9 feet deep at mean low water, amplifying at the bends so as to permit the passage of a vessel 200 feet long from the Delaware River up to the highway bridge over Little Salem Creek, and the removal of the stony bars in front of the city wharves and at the bend above the brickyard. The limits of the dredging necessary for the execution of this project are shown in red on the accompanying tracing.

The cost of the dredging required is estimated as follows:

108,730 cubic yards, place measurement, sand and mud, at 20 cents	$21,746	
22,930 cubic yards, place measurement, gravel and stones, at 30 cents	6,879	
		28,625
Contingencies		2,875
Total		31,500

The work can not be safely estimated at lower prices, since much of the dredged material may have to be deposited above high water.

Between 1871 and 1881, $10,000 was expended upon the river below Salem City. For a history of this work and an account of its results, attention is respectfully invited to my report upon a preliminary examination of the river, dated November 14, 1894, and printed in the Annual Report of the Chief of Engineers for 1895, page 1091. As remarked therein, difficulties connected with the improvement at the mouth seem to have led to its abandonment; but as the channel was never completed to deep water the question of maintenance is still uncertain. With the improved appliances now available, the difficulties attending the work in 1881 would largely disappear, and a reasonable permanence of the increased depths is probable.

The following statistics with reference to the commerce of this river are extracted from my preliminary report of November 14, 1894, above

* Not printed.

referred to. They are the latest received at this office, and are believed to represent essentially the existing commercial conditions:

Salem is located in the midst of a rich agricultural and manufacturing region, and has about 7,000 inhabitants. It is the distributing point for many small towns, such as Quinton, Canton, Harmersville, and others, in all of which are located factories and for which a good deal of freight comes to Salem by water. The river and creek form its boundaries on two sides, thus affording plenty of manufacturing sites directly on the water front. The principal manufactories are 3 glass, 8 canning, 1 oilcloth, 1 button, 1 hosiery, 2 sash, and 2 ice-cream factories. It also has 3 lime-kilns, coal, and lumber yards, and the usual variety of hardware, grocery, and dry goods stores, butcher shops, etc., supplying a large area of country about Salem. For the season of 1894 the output of the canning factories is estimated at 6,000,000 cans.

The present water commerce is estimated as follows: Three hundred and fifty steamers, 120 sailing vessels, and 100 barges and canal boats. Tons of freight, 36,346; value, $1,134,700. It is carried on by two steamboats plying regularly to Philadelphia, small schooners, steam canal boats and barges, and canal boats in tow of tugs.

In my opinion this river is worthy of improvement, and its improvement is justified by the interests of commerce involved.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. R. G. PEARSON, SURVEYOR.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., March 11, 1897.

MAJOR: I have the honor to submit the following report upon the results of a survey of Salem River, New Jersey, from the mouth to the city of Salem, made in October, 1896:

From the 12-foot curve in the Delaware River opposite Elsingboro Point the channel of Salem River pursues a direct course across the flats to the newly erected light-house, at which place it deflects about 30° to the right to enter the river proper. The ruling depth across the flats is 6.5 feet, and the least depth is 5.5 feet; the distance over which there is less than 6 feet of water at mean low water being 1,600 feet. The bed of the stream is here composed of hard sand overlaid by 2 or 3 inches of soft mud. At the bend abreast the light-house the depth becomes 8 feet, and this gradually increases until directly in the mouth of the stream there are over 12 feet of water covering a width of 100 feet.

From the mouth of the river to the bend immediately above the brickyard the depth varies between 10 feet and 23 feet, there being a 9-foot channel having a least width of 150 feet throughout the distance. At this bend, owing to its sharpness, there exists a hole nearly 27 feet deep due to the swirl of the currents in passing around it. Just beyond this hole is a troublesome stony shoal, lying directly in the channel, and carrying a depth of only 6.6 feet at mean low water.

From the bend just considered, to the one next above, where the stream approaches close to the turnpike, there is a ruling depth of 9 feet over a width of 100 feet, answering very well to the requirements of commerce. At the latter bend the tide hole is 46 feet deep at mean low water. The next reach carries a least depth of 12.2 feet, and the 9-foot channel is 250 feet wide. In the bend above this reach, where the stream curves around to the Salem wharves, the tide hole is 31.6 feet deep.

The harbor of Salem is obstructed by a stony shoal, which, originating above and extending out into the stream so as to form a middle ground, ends somewhat below the first wharf. The channel leading up to this wharf consequently ends in a cul de sac, having a width of 80 feet between the bulkhead and the 9-foot curve on the south side of the shoal. The least depth on this bar is 3.2 feet at a distance of 100 feet from the south shore, and as it is composed of stones and gravel, it is a serious menace to navigation. The channel on the opposite side of this quasi middle ground, and which must be entered some distance below the first wharf, leads up to the

turnpike bridge, which has two draw openings of 40 feet each. With the exception of the stony shoal just mentioned, the harbor has a ruling depth of 11 feet over its whole area.

Little Salem Creek (formerly Fenwicks Creek) debouches into Salem River 450 feet above the drawbridge. The chief part of the present commerce of Salem finds shipping place at the wharves and bulkheads along this creek. The stream is navigable for about 3,800 feet, or up to the fixed highway bridge. A dam, about 1 mile above this bridge, has so diminished the tidal capacity that the currents are exceedingly feeble, and it is stated by one acquainted with the situation that since the construction of this barrier the stream has gradually been silting up. The ruling depth up to the bridge is 4.4 feet at mean low water, with a bottom of very soft mud, except in the deep holes in the bends, where there is an uncovering of gravel. The dike on the north side of the creek is full of crevices, permitting the inundation of the marshes at every tide.

The improvement desired by the shipping interests of Salem is the formation of a channel 9 feet deep at mean low water and 100 feet wide, amplifying at the bends so as to permit of the passage of a vessel 200 feet long from the Delaware River up to the highway bridge over Little Salem Creek, and the removal of the stony bars in front of the city wharves and at the bend above the brickyard. Dredging to this end would involve the excavation of 131,660 cubic yards, place measurement, of material, distributed as follows: (*a*) Across the cove from the Delaware River to the 9-foot curve at the mouth of the creek, 74,000 cubic yards of hard sand; (*b*) from the mouth of Little Salem Creek to the upper end of the second bulkhead (where the creek runs northeast and southwest), 34,730 cubic yards, place measurement, of soft mud; (*c*) the removal of the stony obstructions, 3,570 cubic yards, place measurement, of hard gravel, from the one above the brickyard, and 19,360 cubic yards, place measurement, gravel and stones, from the one in the harbor.

The dredging, originally done in 1879, at the bend in the channel near the lighthouse, has maintained itself remarkably well. The channel was dug to a depth of 8 feet at mean low water over a width of 100 feet, the original depth having been 6 to 7 feet. At present there is a depth, in the same locality, of 7 to 8.5 feet over a width of 150 feet, and the distance between the 6-foot contours on the north and south sides of the channel has increased over its value in 1880.

Submitting the above report, together with a map of the river made from the survey of October, 1896, I remain, sir,

Very respectfully, your obedient servant,

R. G. PEARSON, *Surveyor.*

Maj. C. W. RAYMOND,
Corps of Engineers, U. S. A.

APPENDIX H.

IMPROVEMENT OF RIVERS AND HARBORS IN DELAWARE, IN MARYLAND EAST OF CHESAPEAKE BAY, AND OF INLAND WATERWAY FROM CHINCOTEAGUE BAY TO DELAWARE BAY, VIRGINIA, MARYLAND, AND DELAWARE.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT, MAJOR OF ENGINEERS, UNITED STATES ARMY, RETIRED, IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Wilmington Harbor, Delaware.
2. Nanticoke River, Delaware and Maryland.
3. Appoquinimink River, Delaware.
4. Smyrna River, Delaware.
5. Murderkill River, Delaware.
6. Mispillion River, Delaware.
7. Broadkiln River, Delaware.
8. Inland waterway from Chincoteague Bay, Virginia, to Delaware Bay, at or near Lewes, Delaware.
9. Susquehanna River above and below Havre de Grace, Maryland.
10. Chester River, Maryland, from Crumpton to Jones Landing.
11. Choptank River, Maryland.
12. La Trappe River, Maryland.
13. Warwick River, Maryland.
14. Broad Creek River, Delaware.
15. Wicomico River, Maryland.
16. Manokin River, Maryland.
17. Pocomoke River, Maryland.
18. Queenstown Harbor, Maryland.
19. Rockhall Harbor, Maryland.
20. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

21. St. Jones River, Delaware.
22. Mispillion River, Delaware.
23. Cedar Creek, Delaware.

SURVEYS.

24. La Trappe River, Maryland.
25. Cambridge Harbor, Maryland.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., July 12, 1897.

GENERAL: I have the honor to transmit herewith the annual report for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1897.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

H 1.

IMPROVEMENT OF WILMINGTON HARBOR, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 155.

The amount expended for the improvement of the harbor to June 30, 1896, is $366,027.21, of which $250,171.21 was expended on the project of 1881 and its modifications.

The river and harbor act of June 3, 1896, appropriated $5,000, to be used in the discretion of the Secretary of War, for improving the channel between Churchman's bridge and Smalley's bridge, and provided that one-half should be used below the drawbridge at Christiana village and the other half above, and all to be expended during the year 1896.

Under instructions from the Chief of Engineers, a project for the expenditure of the appropriation was submitted. This contemplated a 3-foot low-water channel 25 feet wide. After approval and advertisement for proposals, a contract was made with the Atlas Dredging Company, of Wilmington, Del., at 23 cents per cubic yard, place measurement, which price was regarded as reasonable for the character of the work to be done. Operations under it were begun on October 21 at Churchman's bridge, and continued, working two dredges—one above the Christiana Bridge and one below—for the greater part of the time, until the end of the year, when, by limitation of the law, the contract was closed. There was then a continuous channel with a least depth of 3 feet at mean low water and a width of 25 feet for a distance of 3.35 miles from Churchman's bridge toward the bridge at Christiana village, and a similar channel for a distance of 4,033 feet above that bridge toward Smalley's bridge. The work done, although not carried as far as might have been done but for the restrictions imposed by the law making the appropriation, has improved navigation in this part of the river, and has increased the range of tide about 1 foot as far up as the wharf of the Delaware Glass Sand and Clay Company, in whose interest largely the appropriation is understood to have been obtained. It may be noted parenthetically, however, that that company has not up to this time availed itself of the improvement in the channel, and is not likely to, as far as I am advised.

In both sections the obstructions were found to consist usually of clay banks and hard gravel bars extending across the bed of the stream. In several instances blasting was resorted to where the bottom was unusually hard. During the work two wrecks were removed from the lower section and one from the upper. On the upper section many logs, stumps, and snags were taken out and the banks cleared of the overhanging trees. All material was deposited on the banks above ordinary high water—14,647 cubic yards.

The work which remained to be done in this part of the river at the close of operations to complete the cut throughout was the dredging of the channel in the upper section for a distance of about a third of a mile, to the sand quarry's wharf, and in the lower section a distance of forty-three one-hundredths of a mile, to the drawbridge at Christiana village. The high-water depths of the undredged portions of the upper section were then 4½ to 6 feet, and in the lower 5 to 6 feet.

For the harbor of Wilmington the river and harbor act of June 3, 1896, appropriated, after deducting the $5,000 for the work in the upper river, $15,000 for continuing the improvement "in accordance with the modified project." The act also provided that contracts may be entered

into to complete the project of improvement, not including estimate for flushing basin and extension of jetty, the cost not to exceed $225,846 in the aggregate.

The modified project referred to is understood to be the project for a 21-foot channel, report upon which will be found in the Annual Report of the Chief of Engineers for 1896, pages 973–994.

As it was doubtful that the project could be carried out under the conditions of the law authorizing a contract, a Board of Engineer Officers was convened by the Chief of Engineers to consider and report upon the plan of improvement.

It is to be noted that to the estimate presented by the Board should be added a sum sufficient for rock removal in the channel, the cost of which has been estimated as follows:

6,434 cubic yards, at $14	$90,076
10 per cent for contingencies	9,007
Total	99,083

This, with the Board's estimate for dredging and jetties, would make the total $476,625.

Under instructions from the Chief of Engineers, a project for the expenditure of the available funds in conformity with the recommendation of the Board was submitted to the Chief of Engineers, and after approval proposals were advertised for. The bids received were regarded as too high; and, besides, there was strong reason to believe that a combination existed among some of the bidders. These bids were rejected and the service readvertised. At the second opening, on March 11, 1897, as in the former one, the lowest bidders were the Atlas Dredging Company, of Wilmington, Del., their price being 17.9 cents per cubic yard, place measurement, one-tenth of 1 cent less than their first bid. After some delay, during which the questions of sewage deposits in the harbor and dumping grounds for the material to be dredged were considered, award was made to the Atlas Dredging Company. The contract was executed on May 11, and work thereunder began on June 24, 1897, at a point opposite the Atlantic Refining Company's wharf, where operations closed under the previous contract, last year. At the close of the fiscal year, 5,676 cubic yards of material had been removed and the channel dredged to a width of 150 feet for a length of 385 feet, and for a further length of 400 feet to a width of 100 feet, in both cases to a depth of 15 feet at mean low water.

Soundings made recently indicate the shoaling in the channel to be very marked since last year, making it apparent that the width which it was hoped could be made with the available funds, 150 feet, must be contracted, in order that the immediate necessities of the harbor in the way of dredging in the lower river may be provided for, to some extent at least, with the small amount available. The appropriations for the harbor for the past four years, after deducting the $5,000 for improvements at Churchman's Bridge, and the survey called for by the river and harbor act of August 17, 1894, have averaged between $8,000 and $9,000 a year, while the shoaling is estimated at a rate of 100,000 cubic yards a year, and possibly much more. Strong efforts have been made in the direction of protecting the channel by calling the attention of the local authorities to the matter of sewage deposits, with the view of keeping them down as far as possible, and by information to the United States district attorney of violations of the laws of Congress made for the protection and preservation of navigable waters. The flushing basin to which the Board of Officers of 1896 calls attention is

maintained by the city, and not by the Pusey & Jones Company, as erroneously reported. Since the matter has been agitated it is understood that the city has appropriated $2,000 for the removal of deposits. It may safely be assumed that between $20,000 and $25,000 are needed annually for the maintenance of the 15-foot channel; and unless Congress may see proper to appropriate funds sufficient to cover at least the annual shoaling it is manifest that the 15-foot channel can not be maintained, not to speak of a channel of greater depth. The important commercial interests of this city warrant liberal expenditures in making and maintaining a proper channel.

It is proposed to expend the amount asked for, if appropriated, in continuing work as approved.

Wilmington is a port of entry and in the collection district of Delaware. The amount of revenue collected there during the fiscal year ending June 30, 1897, was $11,500.

AMOUNTS APPROPRIATED.

By act approved—		
July 14, 1836	$15,000	
March 3, 1837	8,000	
July 7, 1838	9,356	
July 11, 1870	15,000	
June 10, 1872	10,000	
March 3, 1873	6,000	
June 23, 1874	6,000	
March 3, 1875	10,000	
August 14, 1876	16,000	
June 18, 1878	7,000	
March 3, 1879	3,500	
June 14, 1880	10,000	
		$115,856
By act approved March 3, 1881	$50,000	
By act passed August 2, 1882	50,000	
By act approved—		
July 5, 1884	25,000	
August 5, 1886	18,750	
By act of August 11, 1888	30,000	
By act approved—		
September 19, 1890	30,000	
July 13, 1892	40,000	
By act of August 17, 1894	25,000	
By act of June 3, 1896	20,000	
		288,750
Aggregate		404,606

Of the above the sum of $2,411.22 has been carried to the surplus fund of the Treasury.

Money statement.

July 1, 1896, balance unexpended		$36,167.57
June 30, 1897, amount expended during fiscal year		12,174.63
July 1, 1897, balance unexpended		23,992.94
July 1, 1897, outstanding liabilities	$950.00	
July 1, 1897, amount covered by uncompleted contracts	23,000.00	
		23,950.00
July 1, 1897, balance available		42.94
Amount (estimated) required for completion of existing project		476,625.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

Abstract of proposals for dredging in Christiana River, Delaware, between Churchman's Bridge and Smalleys Bridge, received by Gen. William F. Smith, United States agent, and opened October 8, 1896.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Haupt & Franklin, Philadelphia, Pa	Oct. 19, 1896	Dec. 31, 1896	28.5
2	Atlas Dredging Co., Wilmington, Del	Oct. 14, 1896	Dec. 24, 1896	23
3	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	June 30, 1897	26
4	Virginia Dredging Co., Richmond, Va	Nov. 1, 1896	Dec. 31, 1896	24

Contract made with Atlas Dredging Company.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened January 12, 1897, for dredging in Wilmington Harbor and Christiana River, Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Dec. 1, 1897	18.5
2	Atlas Dredging Co., Wilmington, Del	Mar. 1, 1897	July 31, 1897	*a* 18
3	Newburg Dredging Co., Newburg, N. Y	Apr. 1, 1897	Nov. 1, 1897	20
4	American Dredging Co., Philadelphia, Pa	June 1, 1897	Aug. 15, 1897	23
5	Sanford & Brooks, Baltimore, Md	Apr. 1, 1897	Jan. 1, 1898	19.5
6	Frank C. Somers, Camden, N. J	Apr. 15, 1897	Dec. 31, 1897	23

a Lowest.

These proposals were rejected.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened March 11, 1897, for dredging in Wilmington Harbor and Christiana River, Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	May 15, 1897	Dec. 30, 1897	20.5
2	American Dredging Co., Philadelphia, Pa	July 1, 1897	Dec. 31, 1897	23
3	Frank C. Somers, Camden, N. J	Apr. 1, 1897	Sept. 1, 1897	22.5
4	Newburg Dredging Co., Newburg, N. Y	May 1, 1897	Dec. 1, 1897	*a* 15
5	Atlas Dredging Co., Wilmington, Del	Apr. 1, 1897	Aug. 31, 1897	17.9

a Scow measurement.

Contract, approved May 28, 1897, made with the Atlas Dredging Company. Work to begin ten days after notification of approval and to be completed five months thereafter. No other contract in force.

COMMERCIAL STATISTICS OF THE CITY OF WILMINGTON FOR THE CALENDAR YEAR 1896.

[Furnished by the Wilmington Board of Trade.]

The tonnage and value of leading articles shipped to and from the port of Wilmington by water during the year 1896 is as follows:

Domestic commerce.

Articles.	Tons.	Value.
Coal	32,000	$79,710
Cord wood	4,000	16,000
Quarry stone	70,900	170,490
Sand	42,500	21,250
Cement	4,800	43,300
Fertilizers	20,000	125,810
Iron supplies and steel	49,100	955,900
Lumber, sawed	15,000	120,570
Ice	2,600	8,900
Powder	2,275	158,525
General merchandise	128,000	16,770,000
Miscellaneous and unclassified	187,000	7,200,000
Total	558,175	25,665,455

Foreign commerce.

Articles.	Quantity.	Value.
IMPORTS.		
Sulphate ammonia, tons	224	$6,171
Nitrate of soda, do	4,669	140,984
Logwood, do	66	1,279
Bananas, bunches	12,000	2,792
Total		151,226
EXPORTS.		
Railroad-car materials		141,036
Petroleum, gallons	89,946,496	4,621,259
Total		4,762,295

VESSELS ENGAGED IN FOREIGN TRADE.

There are engaged in foreign trade from this port (Marcushook) carrying petroleum abroad 38 vessels, of an aggregate registered tonnage of 62,827 tons and of an average draft of 23 feet.

Vessels trading in Wilmington Harbor.

Class.	Number.	Aggregate tonnage.	Draft.
			Feet.
Steamers	3	1,170	6 to 10
Tugs	7	385	4 to 8
Schooners	7	490	.....
Barges	14	6,625	.....
Total	31	8,670	.....

The above vessels are engaged in daily river and harbor work. In addition, there are numerous vessels of all classes engaged in the general coastwise trade, of which no distinct record is kept.

There is invested in freight and passenger lines between Wilmington, Del., Philadelphia, Pa., and Pennsgrove, N. J., $1,000,000. These vessels carry annually 525,000 passengers, and freight valued at $16,375,000.

The following statistics of vessels built and repaired at Wilmington, Del., were furnished by the Harlan & Hollingsworth Company, Jackson & Sharp Company, and Pusey & Jones Company, Wilmington, Del.:

Vessels built.

Class.	Number.	Tonnage.	Draft.
			Feet.
Ferryboat	1	475	7 to 10
Passenger steamers	5	2,239	
Freight steamers	1	410	
Passenger and freight steamers	1	150	5½
Tugboats	2	500	4
Total	10	3,774	.....

Vessels repaired.

Class.	Number.	Tonnage.
Steamers	Not known	62,281
Sailing vessels	do	17,913

REPORT OF BOARD OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., October 3, 1896.

GENERAL: The Board of Officers of the Corps of Engineers constituted by Special Orders No. 30, Headquarters Corps of Engineers, dated August 24, 1896, to consider and report upon the plan of improvement at Wilmington Harbor and Christiana River, Delaware, has the honor to submit the following report:

The instructions of the Board, which are contained in Department letter to the senior member dated August 25, 1896, require the Board to give the subject careful consideration, having in view the existing conditions of the locality and the provisions of the act of June 3, 1896, in relation thereto; but the Board was informed by Department letter to the senior member dated August 29, 1896, that the expenditure of $5,000 from the appropriation for improving Wilmington Harbor and Christiana River, Delaware, to be applied to work between Smalley's bridge and Churchman's bridge is independent of the subject referred for its consideration. A letter from the George W. Bush & Sons Company and the Charles Warner Company to the district engineer, dated August 25, 1896, calling attention to the present need of dredging a part of the harbor, was also referred to the Board for its consideration.

The provisions of the act of June 3, 1896, referred to in the letter of instructions, are as follows:

> Improving harbor at Wilmington, and Christiana River, Delaware: Continuing improvement in accordance with the modified project, twenty thousand dollars: *Provided, moreover*, That of which amount five thousand dollars may, in the discretion of the Secretary of War, be expended during the year eighteen hundred and ninety-six in improving the channel between Churchman's bridge and Smalley's bridge on said river, of which sum one-half shall be expended below and the other half above the drawbridge at Christiana village: *And provided further*, That contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the project of improvement, not including estimate for flushing basin and extension of jetty, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and twenty-five thousand eight hundred and forty-six dollars.

By order of the senior member, the Board was convened at the United States engineer office at Wilmington, Del., on September 4, 1896. The various maps and reports relating to the improvement were examined, and the district engineer was consulted with reference thereto. The Board then adjourned to afford the individual members opportunity to give thorough consideration to the information obtained.

The Board again met at the United States engineer office at Wilmington, Del., on September 12, 1896, and after further discussion personally visited and examined Wilmington Harbor in company with the district engineer. At the final session of the Board, which was held at Wilmington on October 3, 1896, this report was unanimously adopted.

The Christiana River discharges into the Delaware River at a point about 30 miles below the city of Philadelphia. One and a half miles above its mouth it is entered by Brandywine Creek, and the city of Wilmington is located upon the area directly west of the junction of these streams. The harbor of Wilmington includes about 4 miles of the Christiana River and 2 miles of Brandywine Creek.

Under the provisions of the river and harbor act of September 19, 1890, these streams were surveyed and observed to obtain data for a plan for the permanent improvement of the harbor, the investigation being made by a commission of three engineers. The report of the commission, dated June 18, 1891, is printed in the Annual Report of the Chief of Engineers for 1891, volume 2, page 1138.

Under the provisions of the river and harbor act of August 17, 1894, these streams were again surveyed and observed with a view of obtaining a channel depth of 21 feet, the investigation being made under the direction of the district engineer. The report of the district engineer, dated August 15, 1895, with the report of the survey, dated July 31, 1895, is printed in House Doc. No. 66, Fifty-fourth Congress, first session.

Attention is invited to these documents, which contain detailed descriptions, full data with reference to physical conditions, and accounts of previous improvements which it seems unnecessary to reproduce in this report.

The harbor of Wilmington has been under improvement at the expense of the Government at intervals since 1839 to the present time. The total quantity of material removed by dredging is about 1,370,000 cubic yards, scow measurement. The excavation has never been carried to a depth greater than 15 feet at mean low water. A jetty has been constructed at the mouth of the river. The total amount expended upon the improvement from the beginning to the present time is $362,526.81, in which the cost of the jetty is included. It appears from data published in the report of the commission of 1891 that in 1890 the volume of the low-water channel was considerably smaller than it was in 1835, before the commencement of the improvement.

This is not, however, a matter of surprise when it is considered that the annual deposit of material in the river is estimated at not less than 100,000 cubic yards, and may possibly be considerably more. The Government has, in reality, removed not more than about one-fourth of the annual deposit.

The Board is informed by the district engineer that the present condition of the channel is as follows:

From the outer end of the jetty extending up the river for a distance of about 9,200 feet, the channel has a least depth of about 13 feet at mean low water; thence to Market Street Bridge, a distance of about 6,000 feet, a depth of about 9 feet at mean low water; from Market

Street Bridge to the Delaware and Western Railroad Bridge, a distance of about 2,400 feet, a depth greater than 13 feet at mean low water, with a full width of 150 feet except just above Market Street Bridge and just below the Delaware and Western Railroad Bridge, where the width is about 100 feet; and from the Delaware and Western Railroad Bridge to the pulp works, a distance of about 2,000 feet, a depth of 9 feet at mean low water. The average channel depth from the mouth to the pulp works appears therefore to be between 11 and 12 feet at mean low water.

The Board is in doubt as to what constitutes the modified project, in accordance with which the act requires the improvement to be continued, but understands it to be the project contained in the report of Gen. William F. Smith, the district engineer, dated August 15, 1895, and printed in Document No. 66, House of Representatives, Fifty-fourth Congress, first session, modified by the omission of the proposed flushing basin and the extension of the jetty, these constructions being expressly prohibited by the act. If this understanding be correct, the modified project adopted by Congress is as follows:

"To secure by dredging and rock removal a high-water width at the mouth of 500 feet, gradually narrowing to 300 feet at the Third Street Bridge; the channel being confined between those limits by bulkheads or dikes, to be erected by the riparian owners, who would obtain their compensation in the increase of solid land between the bulkheads and present high-water line. The width of the channel at bottom is to be 250 feet to the mouth of the Brandywine, the surface width following the bulkhead line gradually diminishing from 500 feet at the mouth to 300 feet near the Third Street Bridge, which width of 300 feet for the high-water line is to be continued with the bulkhead to the Market Street Bridge. The width at bottom of this section is to be 200 feet. From there to the lower end of the center pier of the bridge of the Pennsylvania Railroad cut-off the channel is to be 200 feet at the bottom, and have the present width at surface. The width above the Market Street Bridge gradually increasing for the high-water line to 500 feet, with the constant inflow of water from the Christiana watershed, is designed to form a kind of tidal basin of that portion of the trough of the river, and aid in increasing the scour on the ebb. The depth of the channel from the mouth to the upper line of the Pulp Works is to be 21 feet at mean low water.

"From that line to the draw pier above mentioned the depth is to diminish to 10 feet at mean low water, giving a slope of 10 feet in 750 in length. From this pier to Newport all shoals having less than 7 feet in depth are to be removed."

The Board is of the opinion that such a project can not be carried out under the conditions imposed. It is not believed that riparian owners will construct bulkheads or dikes along their property for the compensation referred to. Moreover, the Board believes that the existing widths of the tidal prism are now too small for the economical maintenance of the channel contemplated, and that the high-water widths should not be further diminished. All excavated material should be placed outside of the existing high-water lines.

The cost of the maintenance of the channel during the progress of the improvement will depend upon the rate of shoaling and the length of time consumed in the work. The Board is of the opinion that the annual deposit may be greater than is assumed in the estimate of the district engineer, which estimate is based upon the assumption that with an increased depth there would be no increase of deposit. The

amount of this deposit can not be stated with any degree of certainty from the data available, but the Board is satisfied from both theory and experience that an increase in the volume of the low-water channel without a corresponding increase in the volume of the tidal prism must be accompanied by an increase in the rapidity and amount of deposit. In the present project, in which the tidal prism is to be diminished by reducing the high-water widths, an increase in the rate of shoaling is considered inevitable.

The time required for the execution of the work will depend upon the number of dredges which can be simultaneously operated without unduly obstructing the navigation of the river, the rate at which appropriations are made, and the rapidity with which places of deposit can be obtained and prepared for the reception of the excavated material. Under these conditions, the Board is of the opinion that at least two years will be required to do the dredging, and annual maintenance and contingencies during this or a longer period should be included in the estimate.

The Board is further of the opinion that the estimated cost of 13 cents per cubic yard for dredging is too small. This estimate is the average cost per yard for dredging in this locality during the past thirteen years, but most of the material dredged during that time was dumped and not deposited above high water. Under the present conditions all the material must be deposited above high water. The Board does not believe that this can be done at the price estimated.

In view of the above, the Board believes that the execution of the modified project under existing conditions is practically impossible within the limits of expenditure established by the act. The Board, therefore, does not recommend that a continuous contract to complete this project of improvement be made at the present time.

The letter of the George W. Bush & Sons Company and the Charles Warner Company to the district engineer, dated August 25, 1896, which was referred to the Board for consideration, as before stated, reports "that the Christiana River is shoaling rapidly below Third Street Bridge, south side, and also between Pusey & Jones Company's wharf and Market Street Bridge, and that there is only about 8 feet of water at low water at these points;" states that "with the low tides of the fall and winter it will be very difficult for a tug drawing as much as the *Meteor*, with a tow, to pass these without accident;" and requests prompt action in the matter. At these localities shoaling might be expected from the sewerage and drainage of the city of Wilmington. The Board is informed that the Pusey & Jones Company has established an arrangement for flushing, whereby their dock is cleared of deposits, the material being forced into the main ship channel. If the improvement of this locality by dredging is to be continued, the Board suggests the desirability of prohibiting the discharge of material into the channel, under the provisions of section 6 of the river and harbor act of August 17, 1894.

The act of June 3, 1896, appropriates $20,000 for continuing the improvement of Wilmington Harbor and Christiana River. Of this sum $5,000 has already been allotted for a special purpose provided for in the act. The sum of $10,525.27 remains on hand from the amount appropriated for this improvement in the river and harbor act of August 17, 1894. The total amount now available for this improvement is therefore $25,525.27. Since it appears to be the will of Congress to continue this improvement by dredging, without other modifications of existing conditions, and since the navigation interests of the river are greatly in need of temporary relief, the Board recommends that the

sum of $25,525.27, now available, be applied to the dredging of the channel of the Christiana River between its mouth and the pulp works at localities where the work will be of the greatest and most immediate benefit to navigation, and it is suggested that the district engineer be directed to submit a detailed project for the expenditure of these funds in accordance with this recommendation.

The improvement obtained by the expenditure recommended will be temporary and can not be considered as forming any part of a project for permanent improvement. If the permanent improvement of the harbor is to be undertaken, the Board is of the opinion that the work should be conducted in accordance with the following plan:

1. Construct a jetty on the south side of the entrance to the river, as recommended in the report of the Commission of 1891, Annual Report of the Chief of Engineers for 1891, page 1158.

In order that the channel may be maintained by a reasonable amount of annual dredging, a considerable extension of both jetties at the mouth may be found necessary in the future; but this should be avoided if possible, since the existing jetty has now an injurious effect upon the main ship channel of the Delaware River, and a further extension of the jetties would probably compel the shifting of the channel to the east side of Cherry Island Flats, which would not be to the interest of the city of Wilmington.

2. Rectify the channel of the Christiana River at the mouth of the Brandywine by a jetty on the north side of the entrance to the latter.

3. Dredge a channel with the depths and bottom widths provided for in the modified project, and remove the rocky obstructions to the same depths. The high-water widths should not be further diminished. It would be well to correct abnormal variations in width when practicable by widening the narrow parts of the tidal prism.

The approximate cost of executing this project is estimated as follows:

Construction of jetty on south side of mouth	$30,000
Construction of jetty at the mouth of the Brandywine	20,000
Dredging 1,429,000 cubic yards (place measurement), as estimated by General Smith, at 18 cents	257,220
Estimated annual deposit in 2 years, during progress of work, 200,000 cubic yards, at 18 cents	36,000
Total	343,220
Contingencies	34,322
Total	377,542

The project above submitted provides for the formation of a low-water channel of much greater dimensions than the river can naturally maintain, and the preservation of the improved depths will therefore require annual dredging. The amount and cost of this annual work can not be accurately estimated. In view of this fact the Board invites attention to the great importance of preventing the deposit of material in the river, so far as such prevention is possible.

Respectfully submitted.

PETER C. HAINS,
Colonel of Engineers.
CHAS. J. ALLEN,
Major, Corps of Engineers.
C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

H 2.

IMPROVEMENT OF NANTICOKE RIVER, DELAWARE AND MARYLAND.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 157.

The first appropriation under the project is that made by the river and harbor act of June 3, 1896, and is for $3,000. The work to be done therewith has been contracted for, after due advertisement, with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. No work has been done during the last fiscal year.

Nanticoke River is in the collection district of the eastern district of Maryland. Crisfield is the nearest port of entry. As no dutiable articles are discharged there, no revenue was collected during the fiscal year.

AMOUNT APPROPRIATED.

By act of June 3, 1896	$3,000

Money statement.

July 1, 1896, balance unexpended	$3,000.00
June 30, 1897, amount expended during fiscal year	59.12
July 1, 1897, balance unexpended	2,940.88
July 1, 1897, amount covered by uncompleted contracts	2,940.88
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Nanticoke River, Maryland and Delaware, and other localities on eastern shore of Chesapeake Bay.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay, work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Raw bone, phosphate rock, ship timber, etc	256	$5,220
Chemicals, fertilizers, flour, lumber, etc	3,513	81,798
Cattle, horses, hay, etc	576	27,550
General merchandise	1,000	40,000
Total	5,345	154,568
Shipments:		
Canned goods, basket and barrel material, lumber, etc	2,749	140,450
Berries, fruit, corn, wheat, poultry, etc	7,955	349,087
General merchandise	1,000	40,000
Total	11,704	529,537
Total receipts and shipments	17,049	684,105

Vessels trading in Nanticoke River, Delaware and Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Passenger and freight	1	459	6	Triweekly.
Schooners and sloops	Unknown.	1,200	5 to 7	Grain, lumber, and fertilizers.

Fifty sailing vessels of 700 aggregate tonnage built and repaired during the year.

The above statistics were furnished by the Baltimore, Chesapeake and Atlantic Railway Company.

H 3.

IMPROVEMENT OF APPOQUINIMINK RIVER, DELAWARE.

At the beginning of the fiscal year a contract, dated May 23, 1895, was in force for dredging on this and other rivers in Delaware, the work on all of them to be completed by September 1, 1896. Owing, however, to the tardiness of the contractor in the performance of the work on the Smyrna River, one of the improvements provided for, the contract was annulled on July 27, 1896, before the Appoquinimink work was reached.

The river and harbor act of June 3, 1896, made a further appropriation of $5,000 for this improvement.

Before the annulment of the contract above referred to a question had arisen as to the advisability of expending the available funds for the Appoquinimink River in view of the proposed construction of a dike on the Delaware River between Reedy Island and Listons Point, which, it was represented, provided no opening into that river from the Appoquinimink; and as the river and harbor act of June 3, 1896, required the matter to be considered by a Board of Officers, with reference to preserving and improving the navigation of the Appoquinimink, it was concluded, with the approval of the Chief of Engineers, to await the result of the deliberations of that Board. The Board reached the conclusion, which was approved by the Secretary of War, that it was best to abandon for the present the attempt to improve that part of the Delaware River by dike construction; and accordingly, with the approval of the Chief of Engineers, a contract was

made, after due advertisement for proposals, with Egan & Bochman, of Charleston, S. C., for the required dredging at 10 cents per cubic yard, place measurement. The work proposed to be done is the dredging of the channel to a depth of 8 feet at mean low water and a width of 50 feet in straight reaches and widening in the bends through various shoals between a point 6,400 feet below Odessa, where work was last suspended, and the mouth of the river; to widen the cut-off below New Bridge, to dredge off several projecting points, and to redredge shoaling in the upper river, as far as available funds will permit. It was intended to include in this work the making of the proposed cut-off at New Bridge and one below, but it was impracticable to procure the title to the land required for the purpose. The difficulties in the way may possibly be overcome before further improvements are made on the river.

It is proposed to expend the amount asked for, if appropriated, in continuing work under the project.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, and the amount of revenue collected there during the fiscal year ending June 30, 1897, is $11,500.

AMOUNTS APPROPRIATED.

By act approved September 19, 1890	$5,000
By act approved July 13, 1892	5,000
By act of August 17, 1894	5,000
By act of June 3, 1896	5,000
Total	20,000

Money statement.

July 1, 1896, balance unexpended	$9,847.27
June 30, 1897, amount expended during fiscal year	736.25
July 1, 1897, balance unexpended	9,111.02
July 1, 1897, amount covered by uncompleted contracts	9,111.02
Amount (estimated) required for completion of existing project	19,963.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened June 15, 1897, for dredging in Appoquinimink and other rivers in Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
1	Egan & Bochman, Charleston, S. C....	Aug. 15, 1897	July 15, 1898	10 cents Appoquinimink, 12 cents Smyrna, 18 cents Mispillion (average, $11\frac{1}{3}$ cents).
2	Daniel Constantine, Baltimore, Md...	90 days.....	4 months....	14.7 cents.
3	Frank C. Somers, Camden, N. J.....	July 15, 1897	Apr. 30, 1898	13.9 cents.
4	Chester T. Caler, Norfolk, Va.....	Upon completion of Chesapeake Bay contract.	6 months....	18.75 cents.
5	Delaware Construction Co., Wilmington, Del.	July 20, 1897	July 31, 1898	17 cents.

Contract with Egan & Bochman, of Charleston, S. C., approved July 10, 1897, for this and other improvements in Delaware. Work on contract to begin about August 15, 1897, and to be completed by July 15, 1898. No other contracts in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Coal, fertilizers, flour, etc	6,460	$75,250
Horses, sheep, etc	175	16,000
General merchandise	3,450	517,500
Total	10,085	608,750
Shipments:		
Fish, canned goods, etc	875	51,500
Fruit, wheat, poultry, sheep, etc	9,135	293,500
General merchandise	75	7,500
Total	10,085	352,500
Total receipts and shipments	20,170	961,250

Vessels trading in Appoquinimink River, Delaware.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	1	100	6	Triweekly 2 months, then semiweekly.
Steamers	3	410	6 to 7	Transient.
Tugs	6	.....	6 to 7	Transient.
Barges	8	2,000	6 to 7	Charter.
Schooners	4	300	5 to 6	1 regularly; others charter.

The above statistics were furnished by F. B. Watkins, Odessa, Del., accompanied by the following letter:

ODESSA, DEL., *February 13, 1897.*

DEAR SIR: Inclosed find statistics as requested. The business for 1896 was better than 1895, owing to the peach crop and the running of our factories.

Yours, truly,

F. B. WATKINS.

Gen. WILLIAM F. SMITH.

H 4.

IMPROVEMENT OF SMYRNA RIVER, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 159.

The total amount expended on this improvement to June 30, 1896, is $29,338.82, of which $19,338.82 has been expended on this project.

At the beginning of the fiscal year 1897 dredging operations were in progress under the contract of Fred. L. Somers, dated May 21, 1895. Owing mainly to the insufficiency of the contractor's plant, work proceeded slowly, but upon promises that it would be satisfactorily improved, the contractor was permitted to continue. On July 27, 1896, however, the contract was annulled by authority of Chief of Engineers, the contractor having failed to keep his promise or to prosecute the work with proper dispatch. Sealed proposals were then invited, and opened August 6, for the remainder of the dredging contemplated by the contract. The lowest bid, that of Haupt & Franklin, at 19.7 cents per cubic yard, place measurement, was accepted and work thereon begun on September 1, and completed October 14, 1896. During this period the channel width was made 60 feet and the depth 7 feet at mean low water from a point 300 feet above Siscoe's wharf, in the upper section of the river for a distance of 1,610 feet; at Beaverhouse Point, about 4,700 feet below, a shoal 135 feet in length was removed and also one 300 feet

below Mill stream; abreast of Rothwells Landing the channel was widened for a distance of 416 feet; about 2,400 feet below, a cut 60 feet wide was dredged for a length of 125 feet; and at Hiproof Reach, about 3,000 feet farther down, the channel was widened and deepened for a distance of 1,235 feet; and, finally, at Cave Landing Reach, about 1,000 feet below, the channel was dredged for a length of 259 feet, when work was stopped, as the available funds were about exhausted. The material removed, 11,694 cubic yards, mainly mud, sand, and clay, was deposited upon the marsh along the banks of the river. The general result of the operations gave a channel of the approved depth between the turning basin at Smyrna Landing and Cave Landing Reach, a distance of 20,400 feet, the width varying between 40 and 60 feet. This left about one-third of the project to be completed.

The improvements made are of great benefit to navigation and have facilitated expeditious and regular transportation, which before was impossible.

The river and harbor act of June 3, 1896, appropriated $5,000 for continuing the improvement. As the work above described was not completed until late in the fall, it was deemed advisable to suspend action for the expenditure of this appropriation until the following spring, when this work, in conjunction with others in Delaware, could be contracted for and done to better advantage to the Government. On June 15, 1897, after due advertisement, proposals for dredging were opened.

Contract was made with the lowest bidders, Egan & Bochman, of Charleston, S. C., at 12 cents per cubic yard, place measurement. The work to be done is the dredging of a channel to a depth of 7 feet at mean low water and a width of 60 feet from near Cave Landing, where work was last suspended, toward the mouth of the river, and to redredge shoals and remove some projecting points in the upper part of the river, and it is expected that this will be completed this fall.

The amount asked for is for completion of the project for dredging, and, if appropriated, will be expended accordingly.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, and the amount of revenue collected there during the fiscal year ending June 30, 1897, is $11,500.

AMOUNTS APPROPRIATED.

By act approved—		
June 14, 1880	$5,000	
March 3, 1881	3,000	
By act passed August 2, 1882	2,000	
		$10,000
By act of August 11, 1888	10,000	
By act approved—		
September 19, 1890	5,000	
July 13, 1892	3,000	
By act of August 17, 1894	5,000	
By act of June 3, 1896	5,000	
		28,000
Aggregate		38,000

Money statement.

July 1, 1896, balance unexpended	$8,661.18
June 30, 1897, amount expended during fiscal year	3,624.28
July 1, 1897, balance unexpended	5,036.90
July 1, 1897, amount covered by uncompleted contracts	5,000.00
July 1, 1897, balance available	36.90
Amount (estimated) required for completion of existing project	9,365.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	9,365.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of proposals for dredging on Smyrna River, Delaware, received in response to notice dated July 27, 1896, opened August 6, 1896, by Gen. Wm. F. Smith, United States agent.

No.	Name and address.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Atlas Dredging Co., Wilmington, Del	Sept. 1, 1896	Dec. 1, 1896	22
2	American Dredging Co., Philadelphia, Pa	..... do	Oct. 1, 1896	23
3	Haupt & Franklin, Philadelphia, Pa	Aug. 15, 1896	Nov. 1. 1896	*a* 19. 7
4	Frank C. Somers, Camden, N. J	Aug. 8, 1896	Oct. 31, 1896	20

a Lowest; accepted. No formal contract made.

Abstract of proposals received by Gen. Wm. F. Smith, United States agent, and opened June 15, 1897, for dredging in Smyrna and other rivers in Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
1	Egan & Bochman, Charleston, S. C....	Aug. 15, 1897	July 15, 1898	10 cents, Appoquinimink. 12 cents, Smyrna. 18 cents, Mispillion. (Average 11. 3 cents.)
2	Daniel Constantine, Baltimore, Md ...	90 days.....	4 months....	14. 7 cents.
3	Frank C. Somers, Camden, N. J.....	July 15, 1897	Apr. 30, 1898	13. 9 cents.
4	Chester T. Caler, Norfolk, Va	Upon completion of Chesapeake Bay contract.	6 months....	18. 75 cents.
5	Delaware Construction Co., Wilmington, Del.	July 20, 1897	July 31, 1898	17 cents.

Contract with Egan & Bochman, of Charleston, S. C., approved July 10, 1897, for this and other improvements in Delaware. Work on contract to begin about August 15, 1897, and to be completed by July 15, 1898. No other contracts in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Bone, iron, steel, phosphate rock, etc	6, 700	$71, 000
Canned goods, fertilizers, mill-work, etc	8, 590	193, 180
Grain, cattle, horses, sheep, etc	35, 476	139, 650
General merchandise	10. 000	400, 000
Total	60, 766	803, 830
Shipments:		
Railroad ties, ship timber, wood, etc	82, 400	277, 000
Canned goods, crates, baskets, terra cotta, etc	135, 765	833, 500
Fruit, grain, cattle, poultry, etc	20, 215	919, 950
General merchandise	5, 000	200, 000
Total	243, 380	2, 230, 450
Total receipts and shipments	304, 146	3, 034, 280

Vessels trading in Smyrna River, Delaware.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	1	160	5	2 and 3 trips weekly.
Do	2	210	6	Weekly.
Do	2	250	5 and 6	2 and 3 trips part of the year.
Tugs	3	.....	6	Constantly.
Schooners	3	.....	.....	Charter from time to time.

Many small vessels trade in and out of river irregularly, and many vessels make harbor at mouth of river. Also a number of large vessels make periodic trips with lime, etc.

The above statistics were furnished by A. E. Jardine, secretary of the Philadelphia and Smyrna Transportation Company, accompanied by the following letter:

SMYRNA, DEL., *January 28, 1897.*

DEAR SIR: In the reports submitted there are no great changes other than in values. We have another line of steamers here now and will have two new boats ready by early spring. Possibly the two lines may draw more business and make the volume larger for next year. An improvement to the mouth and the cutting off of some points would very materially improve and shorten the river.

Respectfully, yours,

A. E. JARDINE,
Secretary and Treasurer
Philadelphia and Smyrna Transportation Company.

Gen. WM. F. SMITH,
United States Agent.

H 5.

IMPROVEMENT OF MURDERKILL RIVER, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part 1, page 160.

The river and harbor act of June 3, 1896, appropriated $6,500 for continuing the improvement. As the interests of the commerce in this river seemed to require immediate attention, it was determined to go on with the work and not wait until the spring for more favorable weather. After due advertisement, a contract dated November 13, 1896, was made with the Atlas Dredging Company for dredging, at 17½ cents per cubic yard, place measurement, and work thereunder began on November 18, 1896, at the 6-foot curve in Delaware Bay. A channel was made thence to the steamboat wharf inside the river, a distance of 4,700 feet, 60 feet wide and 6 feet deep at mean low water, and inside the river a shoal just above the steamboat wharf was removed, a shoal at Broad Reach was dredged for a length of 2,206 feet, and a shoal at Webb's Landing was dredged for a length of 276 feet, the cut in each case being made 40 feet wide and 6 feet deep at mean low water. The material dredged at the bar, which consisted of mud, sand, and gravel, was scowed away and deposited in a deep hole in Delaware Bay about 2 miles from the work; and that dredged in the river, mud, was thown upon the banks on either side. The quantity of material dredged was 24,425 cubic yards. Operations under the contract were closed on June 16, 1897, and the result of the work done is an unobstructed low-water navigation of 6 feet depth from that depth in Delaware Bay to Lindells Shoal, a distance of 16,000 feet.

The amount asked for, if appropriated, will be expended in dredging at the bar and in the river, in continuation of the project.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1897, is $11,500.

AMOUNTS APPROPRIATED.

By act approved July 13, 1892	$7,000
By act of August 17, 1894	*6,500
By act of June 3, 1896	6,500
Total	20,000

Money statement.

July 1, 1896, balance unexpended	$7,145.79
June 30, 1897, amount expended during fiscal year	6,974.47
July 1, 1896, balance unexpended	171.32
Amount (estimated) required for completion of existing project	32,764.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened November 5, 1896, for dredging in Murderkill River, Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	May 15, 1897	20
2	Atlas Dredging Co., Wilmington, Del	Nov. 16, 1896	Mar. 31, 1897	17.5

Contract made with the Atlas Dredging Company, and approved November 24, 1896, the work to begin November 16, 1896, and to be completed March 31, 1897. Contract completed June 16, 1897. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Bone, rock phosphate, timber, etc	5,959	$87,350.00
Chemicals, lime, dressed lumber, etc	13,860	189,250.00
Hay, cattle, vegetables, etc	1,310	36,062.50
General merchandise	3,500	210,000.00
Total	24,629	522,662.50
Shipments:		
Cord wood, oak piling, etc	2,190	11,400.00
Canned goods, barrels, etc	210	4,200.00
Corn, wheat, cattle, etc	12,613	327,100.00
General merchandise	1,000	60,000.00
Total	16,013	402,700.00
Total receipts and shipments	40,642	925,362.50

*Of this amount $1,500 was expended in removing shoal at mouth of St. Jones River.

Vessels trading in Murderkill River, Delaware.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	1	250	6½	Triweekly.
Schooners	5	345	4 to 6½	Weekly; one schooner occasionally.
Sloops	4	115	3½ to 5	

The above statistics were furnished by Mr. Caleb J. Smithers, Frederica, Del.

H 6.

IMPROVEMENT OF MISPILLION RIVER, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 161.

The total expended on this improvement to June 30, 1896, is $34,507.39, of which $17,507.39 was expended on the present project.

No work was done during the past fiscal year.

Attention was called in the Annual Report for 1895 to the necessity of modifying the present project so as to include the construction of a dike to the 6-foot depth in Delaware Bay, the estimated cost of which is $50,700. Without the dike the improvements can not be a success, nor can they be made even partially available for navigation until they are nearly or entirely completed.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1897, is $11,500.

AMOUNTS APPROPRIATED.

By act approved—		
March 3, 1879	$3,000	
June 14, 1880	4,000	
March 3, 1881	3,500	
By act passed August 2, 1882	3,000	
By act of August 11, 1888	3,500	
		$17,000
By act approved July 13, 1892	12,000	
By act of August 17, 1894	10,000	
		22,000
Aggregate		39,000

Money statement.

July 1, 1896, balance unexpended	$4,492.61
June 30, 1897, amount expended during fiscal year	122.28
July 1, 1897, balance unexpended	4,370.33
July 1, 1897, amount covered by uncompleted contracts	4,370.33
Amount (estimated) required for completion of existing project	2,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	2,000.00
Amount required for maintenance during fiscal year ending June 30, 1899	500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened June 15, 1897, for construction of brush and stone jetty at the mouth of the Mispillion River, Delaware.

No.	Name and address of bidder.	Per cubic yard, in place.		Time.	
		Brush mattress.	Stone.	Commence.	Complete.
1	Benjamin T. Collins, Milford, Del.....	$1.28	$2.60	July 14, 1897	Aug. 14, 1897
2	B. F. Sweeten & Son, Camden, N. J.....	2.25	3.40	July 5, 1897	Sept. 30, 1897
3	Delaware Construction Co., Wilmington, Del..	1.80	3.00	July 20, 1897	Sept. 20, 1897

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened June 15, 1897, for dredging in the Mispillion and other rivers in Delaware.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
1	Egan & Bochman, Charleston, S. C.	Aug. 15, 1897.....	July 15, 1898	10 cents Appoquinimink, 12 cents Smyrna, 18 cents Mispillion (average 11.3 cents).
2	Daniel Constantine, Baltimore, Md.	90 days.....	4 months....	14.7 cents.
3	Frank C. Somers, Camden, N. J.	July 15, 1897.....	Apr. 30, 1898	13.9 cents.
4	Chester T. Caler, Norfolk, Va.	Upon completion of Chesapeake Bay contract.	6 months....	18.75 cents.
5	Delaware Construction Co., Wilmington, Del.	July 20, 1897.....	July 31, 1898	17 cents.

List of contracts in force, with names of contractors, date of approval, etc.

Name of contractor.	Date of approval.	Time.		Work.
		Commence.	Complete.	
Egan & Bochman, Charleston, S. C.	July 10, 1897	Aug. 15, 1897	July 15, 1898	Dredging.
Benj. T. Collins, Milford, Del.....	July 9, 1897	July 14, 1897	Aug. 14, 1897	Construction of dike.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Raw bone, phosphate rock, iron, etc	20,410	$224,500
Lumber, marble, lime, etc	4,284	33,296
Hay, cattle, vegetables, etc	990	19,800
General merchandise	2,676	78,870
Total	28,360	356,466
Shipments:		
Lumber, pier ties, etc	16,822	80,845
Canned goods, fertilizers, etc	6,026	313,248
Grain, fruit, etc	4,363	95,940
General merchandise	205	4,100
Total	27,416	494,133
Total receipts and shipments	55,776	850,599

Vessels trading in Mispillion River, Delaware.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Tug	1	20	5	Daily.
Schooners	20	1,478	4 to 6	General trading.
Sloops	2	45	3½ and 4	Oyster trade.
Barges	15	800	4½	Lumber.

One schooner, tonnage 76 and 3½ feet draft, built, and 46 vessels repaired during the year.

The above statistics were furnished by Mr. George F. Pierce, of Milford, Del.

H 7.

IMPROVEMENT OF BROADKILN RIVER, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 162.

The amount estimated for the completion of the existing project is for the improvement at the mouth of the river as designed in 1871 and modified in 1881. No work has been done on it since 1890, and no funds have been available for the purpose. I do not recommend any expenditure at present for an outlet for the Broadkiln into Delaware Bay, taking into consideration that success in making it will be most uncertain, and the probability that the Broadkiln can be connected with the inland waterway from Chincoteague Bay to Delaware Bay at Lewes at much less cost and with greater advantage to both.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1897, is $11,500.

It was not practicable to obtain commercial statistics.

AMOUNTS APPROPRIATED.

By act approved—		By act passed August 2, 1882	$5,000
March 3, 1873	$10,000	By act of August 11, 1888	10,000
June 14, 1880	5,000		
March 3, 1881	5,000	Total	35,000

Money statement.

Amount (estimated) required for completion of existing project	$21,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

H 8.

IMPROVEMENT OF INLAND WATERWAY FROM CHINCOTEAGUE BAY, VIRGINIA, TO DELAWARE BAY, AT OR NEAR LEWES, DELAWARE.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 162.

At the close of the fiscal year ending June 30, 1896, $165,971.04 had been expended on the work. A cut had been made 4 miles long, 20 feet wide at bottom, and 4 feet deep below the mean level of Assawaman

Bay across the neck of land lying between Little Assawaman Bay and Whites Creek, a tributary of Indian River Bay, and three temporary wooden bridges built over it; a cut 20 feet wide and 6 feet deep below datum (mean low water at Delaware breakwater) had been made from that depth in Rehoboth Bay to a point 1,250 feet south of the Delaware, Maryland and Virginia Railroad crossing at Rehoboth, a distance of 9,000 feet, and another cut, in continuation of this, extending to the railroad reservation, a distance of 1,125 feet, had been made to a depth of 2 feet below mean low water level; and north of the railroad crossing a cut was made to a point 1,000 feet north of the boundary of the railroad track. Of this latter distance the lower 800 feet was excavated to a depth of 9½ feet and the remaining 200 feet to an average depth of 15 feet above datum, the depth of cutting in the first averaging approximately 17½ feet and in the latter about 8 feet. All slopes of excavations were made 2 to 1 along the lines determined by the final width at the base of the proposed cut and the configuration of the ground. The cut between Assawaman Bay and Whites Creek was made and the three bridges built in 1891. The remainder of the work described was done between 1893 and February, 1896.

* * * * * * *

There is no noticeable traffic yet at any points of this inland waterway.

The river and harbor act of June 3, 1896, appropriated $25,000 for continuing this improvement, to be used from Delaware Bay to Indian River, and provided "that no part of this appropriation shall be expended until the right of way is secured without cost to the United States, but the right of way over any railroad or county bridge shall not be subject to this proviso and may be secured by condemnation proceedings."

It was supposed that the United States had secured the right of way along the entire length of the canal, but, as stated in my report for 1895, the Delaware, Maryland and Virginia Railroad Company denies this as to its railroad crossings over the line of the canal, and that matter is now in litigation. Until that and possibly other disputes as to title are disposed of, it is not likely that much, if any, dredging work can judiciously be done under the project.

The amount asked for, if appropriated, will be expended in continuing the improvements between Chincoteague Inlet and Delaware Bay. The most useful work to be done is between Ocean City, Md., and Indian River Bay.

AMOUNTS APPROPRIATED.

By act of August 5, 1886	$18,750	By act of August 17, 1894	$25,000
By act of August 11, 1888	50,000	By act of June 3, 1896	25,000
By act approved September 19, 1890	50,000	Total	193,750
By act approved July 13, 1892	25,000		

Money statement.

July 1, 1896, balance unexpended	$27,778.96
June 30, 1897, amount expended during fiscal year	726.66
July 1, 1897, balance available	27,052.30
Amount (estimated) required for completion of existing project	156,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

H 9.

IMPROVEMENT OF SUSQUEHANNA RIVER ABOVE AND BELOW HAVRE DE GRACE, MARYLAND.

About $10,000 of the appropriations of $4,000 each, made by river and harbor acts of September 19, 1890, July 13, 1892, and August 17, 1894, is still unexpended, the amount available being limited to expenditure above the Philadelphia, Wilmington and Baltimore Railroad Bridge and regarded insufficient to bring about results permanent enough to justify its expenditure.

The project for improvement above and below Havre de Grace includes the making of a 15-foot low-water channel below the town and the removal of the shoal on the west side of the channel opposite Watson Island, above Havre de Grace, to a depth of 8 feet below mean low water. The channel below the town was dredged to a depth of 12 feet in 1885. The survey of December, 1891, showed that it had partially shoaled again. The removal of the eastern bank of the shoal opposite Watson Island has been in progress since 1883, and is done to prevent in a measure the formation of ice gorges at or near the town of Port Deposit, situated 2¼ miles above the island. About $32,000 has been expended in dredging this shoal, resulting in some temporary relief, but the survey above referred to and that of 1894 show that the area dredged had resumed nearly its original state since the work was suspended in 1889.

Up to the close of the fiscal year ending June 30, 1896, $161,067.37 had been expended on this section of the river, including $49,729.15 expended for dredging the channel to the Fishing Battery Light-House, for breakwaters and piers, and for other work for the Fish Commission.

Susquehanna River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, was $2,361,264.39.

It was impracticable to obtain complete commercial statistics.

AMOUNTS APPROPRIATED.

By act approved—		
August 30, 1852	$10,000	
June 23, 1866	26,400	
July 25, 1868 (allotment)	5,000	
April 10, 1869 (allotment)	990	
July 11, 1870	12,000	
June 14, 1880	28,000	
March 3, 1881	15,000	
		$97.390
By act passed August 2, 1882	25,000	
By act approved—		
July 5, 1884	20,000	
August 5, 1886	6,000	
By act of August 11, 1888	10,000	
By act approved—		
September 19, 1890	4,000	
July 13, 1892	4,000	
1879, allotment from general appropriation for examinations and surveys	500	
By act of August 17, 1894	4,000	
		73,500
Aggregate		170,890

Money statement.

July 1, 1896, balance unexpended	$9,822.63
July 1, 1897, balance unexpended	9,822.63
Amount (estimated) required for annual dredging	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

H 10.

IMPROVEMENT OF CHESTER RIVER, MARYLAND, FROM CRUMPTON TO JONES LANDING.

This river was under improvement previous to 1890, when the present project was adopted. At that time there were many shoals in the river between Crumpton and Jones Landing, with 3 to 4 feet of water over them.

The adopted project for improvement is based upon a survey made in 1889, and is for a 6-foot low water channel 60 feet wide from the drawbridge at Crumpton to a point about 1 mile below Millington, supposed to be at Jones Landing, a distance of 6¼ miles. The estimated cost is $12,750. At the close of the fiscal year ending June 30, 1896, $9,328.40 had been expended and the channel had been improved at various points, in accordance with the project, from Crumpton to a point about 820 feet above Mill Branch Junction, a distance of about 5 miles. This left about 1¼ miles to be improved to complete the project. No work has been done during the past fiscal year.

The river and harbor act of June 3, 1896, appropriated $1,500 for continuing the improvement, and the work to be done therewith has been contracted for with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. This work and others along the Eastern Shore of Chesapeake Bay under the contract are by its terms to be completed by June 30, 1898.

The amount asked for, if appropriated, will be expended in completing the project.

This work is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNTS APPROPRIATED.

By act approved—	
September 19, 1890	$5,000
July 13, 1892	3,000
By act of August 17, 1894	1,500
By act of June 3, 1896	1,500
Total	11,000

Money statement.

July 1, 1896, balance unexpended	$1,671.60
June 30, 1897, amount expended during fiscal year	152.50
July 1, 1897, balance unexpended	1,519.10
July 1, 1897, amount covered by uncompleted contracts	1,500.00
July 1, 1897, balance available	19.10
Amount (estimated) required for completion of existing project	3,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	1,750.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Chester River, Maryland, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other work along the eastern shore of Chesapeake Bay, work on it to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Fertilizers	1,612	$40,300
General merchandise	14,875	579,000
Total	16,487	619,300
Shipments:		
Corn, wheat, fruit, etc	13,875	302,761
General merchandise	5,751	230,040
Total	19,626	532,801
Total receipts and shipments	36,113	1,152,101

Vessels trading in Chester River, Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Screw steamer	1	360	7½	Daily part of the year, and then triweekly.

The above statistics were furnished by Mr. George W. Warfield, president Chester River Steamboat Company, accompanied by the following letter:

BALTIMORE, MD., *April 20, 1897.*

DEAR SIR: We are in receipt of yours of the 19th and beg to state the statistics furnished you in 1896 for 1895 were intended to show business in the Crumpton district, all the territory affected by the improvements made under your supervison adjacent to Crumpton, while the statistics furnished you some weeks ago relative to 1896, and which you compare with the former, show the value of business of the entire river. The 1896 report covers our whole business; that of 1895, only that portion derived from the territory north of Chestertown. The Crumpton business was but little more than half of that in 1895.

Yours, truly,

GEORGE WARFIELD, *President.*

Gen. WM. F. SMITH,
United States Agent.

H 11.

IMPROVEMENT OF CHOPTANK RIVER, MARYLAND.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 164.

The river and harbor act of June 3, 1896, appropriated $2,000 for continuing the improvement, and the work to be done therewith has been contracted for with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. This work and others along the Eastern Shore of Chesapeake Bay under the contract are by its terms to be completed by June 30, 1898.

It is proposed to expend the amount asked for, if appropriated, in continuing dredging under the project.

Choptank River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNTS APPROPRIATED.

By act approved—	
June 14, 1880	$5,000
March 3, 1881	5,000
By act passed August 2, 1882	5,000
By act approved—	
July 5, 1884	5,000
August 5, 1886	10,000
By act of August 11, 1888	7,500
By act approved—	
September 19, 1890	7,500
July 13, 1892	3,000
By act of August 17, 1894	2,000
By act of June 3, 1896	2,000
Total	52,000

Money statement.

July 1, 1896, balance unexpended	$2,133.40
June 30, 1897, amount expended during fiscal year	293.03
July 1, 1897, balance unexpended	1,840.37
July 1, 1897, amount covered by uncompleted contracts	1,840.37
Amount (estimated) required for completion of existing project	16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Choptank River, Maryland, and other localities on Eastern Shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along Eastern Shore of Chesapeake Bay, work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Ice, oysters, fish, etc	126	$2,307
Canned goods, fertilizers, lumber, etc	3,592	89,499
Cattle, horses, sheep, etc	403	48,078
General merchandise	7,215	288,600
Total	11,336	428,484
Shipments:		
Canned goods, lumber, flour, etc	1,581	74,640
Fruit, cattle, wheat, poultry, etc	2,316	66,369
General merchandise	1,960	78,400
Total	5,857	219,405
Total receipts and shipments	17,193	647,893

Vessels trading in Choptank River, Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	2	1,208	5½	Daily service.

The above statistics were furnished by the Baltimore, Chesapeake and Atlantic Railway Company, and represent the business of that line only.

H 12.

IMPROVEMENT OF LA TRAPPE RIVER, MARYLAND.

For previous history, see Annual Report of the Chief of Engineers for 1897, Part I, page 165.

The amount expended to the close of the fiscal year 1896 was $7,213.87, and the proposed channel within the river had been completed. The proposed channel at the mouth, about 1,600 feet long, had been dredged to the approved width of 150 feet for a distance of 400 feet, and to a width of 100 feet only for the remaining 1,200 feet. No work has been done during the past fiscal year. The latter portion, therefore, remains to be widened 50 feet in order to conform to the approved project, and it is estimated that to complete it $2,500 will be required in addition to the amount already expended and originally estimated as the cost of the whole improvement. This increase in the estimate is solely due to shoaling in the upper river since the survey was made and to the treacherous character of the material at the bar. The latter consists principally of live, pure sand, and already, during the progress of the first contract, at that point it became necessary to remove and pay for a much larger quantity of material on that account than was estimated for, and the depth of cutting had to be increased to maintain the dredged depth, the contract being for scow measurement. It is expected, however, that the additional amount asked for will complete the channel if no unforeseen shoaling has taken place since operations were suspended.

It was impracticable to obtain commercial statistics.

La Trappe River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNTS APPROPRIATED.

By act approved July 13, 1892	$2,500
By act of August 17, 1894	4,750
Total	7,250

Money statement.

July 1, 1896, balance unexpended	$36.13
July 1, 1897, balance unexpended	36.13
Amount (estimated) required for completion of existing project	2,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	2,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

H 13.

IMPROVEMENT OF WARWICK RIVER, MARYLAND.

For previous history, see Annual Report of the Chief of Engineers for 1897, Part I, page 166.

At the close of the fiscal year ending June 30, 1896, $13,918.82 had been expended for the improvement of this river, of which $7,918.82 was on the present project.

The river and harbor act of June 3, 1896, appropriated $2,000 for continuing the improvement, and the work to be done therewith has been contracted for with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. This work and others along the eastern shore of Chesapeake Bay under the contract are, by its terms, to be completed by June 30, 1898.

It is proposed to expend the amount asked for, if appropriated, in continuing dredging under the project.

Warwick River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNTS APPROPRIATED.

By act approved June 14, 1880	$3,000
By act approved March 3, 1881	3,000
Total	6,000
By act approved July 13, 1892	6,000
By act of August 17, 1894	2,000
By act of June 3, 1896	2,000
Total on present project	10,000
Aggregate	16,000

Money statement.

July 1, 1896, balance unexpended	$2,081.18
July 1, 1897, balance unexpended	2,081.18
July 1, 1897, amount covered by uncompleted contracts	2,000.00
July 1, 1897, balance available	81.18
Amount (estimated) required for completion of existing project	8,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	6,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867, and of sundry civil act of June 4, 1897.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Warwick River, Maryland, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement
		Commence.	Complete.	
				Cents
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16 0
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14 5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9 5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17.0
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19.0
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay, work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Fish, canned goods, flour, etc	858	$34,273
Cattle, horses, etc	180	4,522
General merchandise	670	26,800
Total	1,708	65,595
Shipments:		
Canned goods, fertilizers, etc	376	22,464
Fruit, wheat, farm products, etc	884	26,918
General merchandise	649	25,960
Total	1,909	75,342
Total receipts and shipments	3,617	140,937

Vessels trading in Warwick River, Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Trips
			Feet.	
Steamers	2	1,208	5½	Daily service.

The above statistics were furnished by the Baltimore, Chesapeake and Atlantic Railway Company, and represent the business of that line only. About 100 sloops, bugeyes, and schooners also trade here.

H 14.

IMPROVEMENT OF BROAD CREEK RIVER, DELAWARE.

This river is in the western portion of Sussex County, Del., and is a tributary of the east fork of the Nanticoke River. It is a tidal stream, and navigable for about 7 miles. At the head of navigation is situated the town of Laurel, with extensive manufacturing and commercial industries.

The General Government expended $35,000 between the years 1881 and 1889 in improving about 2 miles of the river at and immediately below Laurel. A channel 50 feet wide and 6 feet deep at mean low

water was dredged, and the commerce of the river increased more than 100 per cent in eight years.

In accordance with the requirements of the river and harbor act of September 19, 1890, a preliminary examination was made of this river with the view of enlarging the channel previously dredged. The report, with estimates, is printed in the Annual Report of the Chief of Engineers for 1891, pages 1209–1211. The plan of improvement therein recommended is to dredge the channel to a depth of 8 feet at mean low water and to a width of 70 feet, beginning above the Bethel Bridge, about 3 miles below Laurel, at an estimated cost of $15,000.

The project was adopted in 1892, an appropriation of $5,000 having been made by Congress July 13. The amount expended on the improvement to the close of the fiscal year 1896 was $39,499.85, of which $35,000 was expended before the adoption of the present project. At that date a channel of the approved dimensions, 70 feet wide and 8 feet deep at mean low water, had been dredged for a distance of 6,455 feet, beginning at a point 1,000 feet above the bridge at Bethel and ending 680 feet above Hitch's upper wharf, and an additional cut, also 8 feet deep but only 40 feet wide, was dredged for a length of 215 feet across a shoal situated just beyond the section of the channel that had been dredged to the full width. This was done in 1893, and no work under the project has been done since. The river and harbor act of 1894 appropriated $5,000 for continuing this improvement, of which as much as might be necessary should be applied to the removal of the bar that extended from the railroad bridge at Seaford toward the mouth of the Nanticoke River. The entire appropriation was used in doing this work.

The river and harbor act of June 3, 1896, appropriated $5,000 for continuing the improvement, and the work to be done therewith has been contracted for with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. This work and others along the eastern shore of Chesapeake Bay under the contract are by its terms to be completed by June 30, 1898.

The amount asked for, if appropriated, will be expended in continuing the improvements toward Laurel, in accordance with the project.

Broad Creek is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected for the fiscal year ending June 30, 1897, is $11,500.

It was not practicable to obtain complete commercial statistics.

AMOUNTS APPROPRIATED.

By act approved—		By act approved July 13, 1892	$5,000
June 14, 1880	$5,000	By act of August 17, 1894	*5,000
March 3, 1881	10,000	By act of June 3, 1896	5,000
By act passed August 2, 1882	5,000		
By act approved August 5, 1886	10,000	Total, present project	15,000
By act of August 11, 1888	5,000		
Total	35,000	Aggregate	50,000

Money statement.

July 1, 1896, balance available	$5,100.64
June 30, 1897, amount expended during fiscal year	169.90
July 1, 1897, balance unexpended	4,930.74
July 1, 1897, amount covered by uncompleted contracts	4,930.74
Amount (estimated) required for completion of existing project	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	5,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

* This appropriation was applied to removing bar on Nanticoke River, under the terms of the appropriation.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Broad Creek River, Delaware, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days.	16 months.	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay, work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

H 15.

IMPROVEMENT OF WICOMICO RIVER, MARYLAND.

The portion of the river at and just below Salisbury has been under improvement by the United States since 1872. At that time the navigable channel, with a least depth of 8 feet at low water, extended to within 2 miles below Salisbury. The extreme upper portion, as far as the milldam, in the heart of the town, was quite shoal, and had an average depth of only 18 inches at low tide. Between the years 1872 and 1885 a channel was dredged from 75 to nearly 100 feet wide and 7 feet deep at low water from deep water below to the drawbridge in the town, at a total cost to the Government of about $50,000, certain portions of the channel being protected on each side by dikes constructed of piles and sheet piling. The expense of building these dikes was partly defrayed by the citizens of Salisbury, who also subsequently expended about $25,000 in dredging a large section of the river above the drawbridge to a depth of 7 feet. It is well known what an important influence these improvements had after they were begun upon the remarkable growth of the town and the commerce of the river.

The project for this improvement is based upon a survey made in 1889, and is for a channel 9 feet deep at mean low water, beginning at the 9-foot depth in the river near Goose Island wharf and ending at the drawbridge in the town of Salisbury, the width to be 100 to 150 feet. The estimated cost is $23,200. The project was adopted in 1890, an appropriation of $10,000 having been made by Congress to begin improvements, and a further appropriation of $6,500 was made in 1892. In the latter year 30 feet of the proposed width of the channel was dredged to the approved depth of 9 feet throughout the section of the river covered by the project.

On June 30, 1896, $19,473.60 of the appropriations made for the improvement had been expended on the present project, and the channel dredged to the approved dimensions from the drawbridge to opposite Williams Point, about 5,730 feet below. This left about 1 mile to be improved to complete the project. No work has been done

during the past fiscal year. The entire amount expended for the improvement of the river to June 30, 1896, is $69,473.60.

The river and harbor act of June 3, 1896, appropriated $3,700 for completing the improvement, and the work to be done therewith has been contracted for with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement. This work and others along the eastern shore of Chesapeake Bay are by the terms of the contract to be completed by June 30, 1898.

Wicomico River is in the collection district of the eastern district of Maryland. Crisfield is the nearest port of entry. As no dutiable articles are discharged there, no revenue was collected during the fiscal year.

AMOUNTS APPROPRIATED.

By act of—	
June 10, 1872	$5,000
March 3, 1873	5,000
June 28, 1874	5,000
March 3, 1875	5,000
August 14, 1876	5,000
June 18, 1878	5,000
March 3, 1879	3,000
June 14, 1880	5,000
March 3, 1881	2,000
July 5, 1884	10,000
Total	50,000
September 19, 1890	10,000
July 13, 1892	6,500
August 17, 1894	3,000
June 3, 1896	3,700
Total on present project	23,200
Aggregate	73,200

Money statement.

July 1, 1896, balance unexpended	$3,726.40
July 1, 1897, amount covered by uncompleted contracts	3,726.40

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Wicomico River, Maryland, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay; work on contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Bone, phosphate rock, oysters, etc	4,643	$67,294
Fertilizers, flour, dressed lumber, millwork, etc	76,809	905,333
Horses, cattle, grain, etc	1,007	32,860
General merchandise	5,420	216,800
Total	87,879	1,222,287
Shipments:		
Coal, wood, etc	6,725	13,800
Canned goods, fertilizers, machinery, etc	21,363	215,208
Corn, wheat, fruit, etc	2,285	153,009
General merchandise	4,287	161,480
Total	34,660	543,497
Total receipts and shipments	122,539	1,765,784

Vessels trading in Wicomico River, Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamer	1	704	5½	Triweekly.
Do	1	175	6½	Weekly.
Schooners	12	786	6½ to 10	Do.
Do	2	1,000	.....	Occasionally.

The above statistics were furnished by the Baltimore, Chesapeake and Atlantic Railway Company and the Hon. E. Stanley Toadvin, of Salisbury, Md. Mr. Toadvin adds: "Salisbury will be made a distributing point for Florida shingles, and three large schooners or others of like character will be employed in the trade. Hundreds of small sloops, etc., come here frequently during the year."

H 16.

IMPROVEMENT OF MANOKIN RIVER, MARYLAND.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 168.

No work has been done on the improvement during the past fiscal year.

The river and harbor act of June 3, 1896, appropriated $4,000 for continuing the improvement, but directed that $2,000 of the appropriation should be expended in improving the river between Dashiells Creek and a point on the river known as the Red Bridge or County Wharf. After due advertisement, a contract was made with Chester T. Caler, of Norfolk, Va., at 9½ cents per cubic yard, place measurement, for the dredging required. Under this contract it is proposed to widen the 60-foot cut at the "Flats" to 80 feet, and to redredge where the channel is found to have shoaled; and in the upper river to widen and deepen the channel to 50 feet and 6 feet, respectively, between Dashiells Creek and the steamboat wharf, as far as the available funds will permit, at both places.

Manokin River is in the collection district of the eastern district of Maryland. Crisfield is the nearest port of entry. As no dutiable articles are discharged there, no revenue was collected during the fiscal year.

AMOUNTS APPROPRIATED.

By act approved—	
September 19, 1890	$7,500
July 13, 1892	7,500
Act of August 17,1894	4,000
Act of June 3, 1896	4,000
Total	23,000

Money statement.

July 1, 1896, balance unexpended	$4,202.00
June 30, 1897, amount expended during fiscal year	177.00
July 1, 1897, balance unexpended	4,025.00
July 1, 1897, amount covered by uncompleted contracts	*4,025.00
Amount (estimated) required for completion of existing project	9,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	4,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Manokin River, Maryland, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay; work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Coal, lumber, millwork	5,890	$33,800
Fertilizers, grain, produce	5,062	170,210
Live stock, hay, flour	1,434	35,300
General merchandise	1,284	423,000
Total	13,670	662,310
Shipments:		
Wood, timber, ties	10,480	84,000
Canned goods, flour, etc	2,782	71,856
Fruits, oysters, hay, grain, etc	5,922	173,862
General merchandise	26,800	1,132,600
Total	46,034	1,462,318
Total receipts and shipments	59,704	2,124,628

*Of this amount, $2,000 is for work in the upper river not covered by the project.

The foregoing statistics were furnished by Mr. Hampden P. Dashiell, of Princess Anne, Md., accompanied by the following letter:

PRINCESS ANNE, MD., *May 18, 1897.*

SIR: I beg to hand to you herewith as correct a statement of commercial statistics for Manokin River, Maryland, as I am able to obtain.

The obstruction in the river between Dashiell Creek and the steamboat wharf is a serious barrier to rapid increase of business.

Very truly, yours,

HAMPDEN P. DASHIELL.

Gen. WM. F. SMITH,
United States Agent.

H 17.

IMPROVEMENT OF POCOMOKE RIVER, MARYLAND, BELOW SNOW HILL.

For previous history see Annual Report of the Chief of Engineers for 1897, Part I, page 169.

The amount expended for the improvement of this river to June 30, 1896, is $20,500, which was on a previous project.

The river and harbor act of June 3, 1896, appropriated $5,000, the first appropriation on this project. A project for the expenditure of this money having been approved by the Chief of Engineers a contract was made, after due advertisement, with Chester T. Caler, of Norfolk, Va., for dredging at 9½ cents per cubic yard, place measurement, and work under the contract begun on April 6, 1897. On June 3 operations were brought to a close, 39,329 cubic yards of material, consisting of mud and sand, having been dredged and placed upon the banks of the river. The work done was the widening and deepening of the channel as follows: At Nassawango Creek a cut 130 feet wide was made across the bar for a length of 610 feet; about 2,750 feet above a cut was made 100 feet wide for a length of 750 feet to the lower end of the third cut-off; thence to the lower end of the second cut-off, a distance of 640 feet, the channel was dredged to a width of 130 feet; the second cut-off was dredged for a width of 80 feet its entire length; about 700 feet above the latter, at Huffs Shoals, the channel was dredged to a width of 130 feet for a length of 1,015 feet to the lower end of the upper cut-off; the upper cut-off was dredged to a width of 130 feet for a length of 580 feet, and to a width of 100 feet for the remaining 600 feet; and thence to the harbor at Snow Hill, a distance of 610 feet, the channel was widened to 130 feet. The channel was made 9 feet deep at mean low water at these places, resulting in a 9-foot channel, with widths varying between 80 and 130 feet between Nassawango Creek and Snow Hill. At the county wharf at Snow Hill a shoal was also removed for a width and length of 40 and 100 feet, respectively, to a depth of 7 feet.

It is proposed to expend the amount asked for, if appropriated, in dredging the channel to the full width and depth in accordance with the project.

Pocomoke River is in the collection district of the eastern district of Maryland. Crisfield is the nearest port of entry. As no dutiable articles are discharged there no revenue was collected during the fiscal year.

AMOUNTS APPROPRIATED.

By act approved—	
June 18, 1878	$10,000
March 3, 1879	2,500
August 5, 1886	8,000
Total	20,500
By act of June 3, 1896	5,000
Aggregate	25,500

Money statement.

July 1, 1896, balance unexpended	$5,000.00
June 30, 1897, amount expended during fiscal year	4,487.26
July 1, 1897, balance unexpended	512.74
July 1, 1897, outstanding liabilities	373.63
July 1, 1897, balance available	139.11
Amount (estimated) required for completion of existing project	9,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	4,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of proposals received by Gen. William F. Smith, United States Agent, and opened December 2, 1896, for dredging in Pocomoke River, Maryland, and other localities on eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along eastern shore of Chesapeake Bay; work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Coal, stone, ice	1,270	$7,200
Fertilizers, flour, millwork, etc	1,972	76,100
Cattle, hogs, hay, etc	652	32,500
General merchandise	1,500	60,000
Total	5,394	175,800
Shipments:		
Cord wood, logs, ship timber, etc	2,115	13,650
Canned goods, crates, lumber, etc	18,744	207,300
Fruit, grain, eggs, etc	3,817	95,400
Poultry, sheep, etc	2,006	30,840
Total	26,682	347,190
Total receipts and shipments	32,076	522,990

Vessels trading in Pocomoke River, Maryland.

Class.	Number.	Aggregate tonnage.	Draft.	Remarks.
			Feet.	
Passenger and freight steamers.....	1	654	6.5	Semiweekly.
Schooners and sloops.....	Unknown	6,610	5 to 7	Grain, lumber, fertilizers.

Ninety sailing vessels, schooners, sloops, barges, and bugeyes, of a tonnage of 4,600, built and repaired during the year.

The statistics were furnished by the Baltimore, Chesapeake and Atlantic Railway Company.

H 18.

IMPROVEMENT OF QUEENSTOWN HARBOR, MARYLAND.

This harbor was last improved by the General Government between the years 1871 and 1880. In the latter year a project for making a channel 100 feet wide and 8 feet deep at mean low water from Chester River to the inner harbor was completed. The amount expended for the improvement of this harbor to June 30, 1896, is $14,000, which was on previous projects.

The river and harbor act of June 3, 1896, appropriated $5,000 for continuing the improvement.

As no examination of the channel had been made since the suspension of work in 1880, it was deemed advisable to make one, to determine what improvement was now required and could be made with the appropriation. A survey was accordingly made. The harbor was found to have shoaled considerably, and by authority of the Chief of Engineers it was concluded to restore the channel to the depth of 8 feet at mean low water, and width of 100 feet from the 8-foot curve in the Chester River to the inner harbor.

After due advertisement contract was made with Chester T. Caler, of Norfolk, Va., for the required dredging, at 9½ cents per cubic yard, measured in place, and operations thereon began on April 22, and continued to June 15, 1897, when they were brought to a close, the project having been completed, resulting in a channel 8½ feet deep at mean low water and 100 feet wide from the Chester River to the inner harbor, a distance of 2,993 feet.

Queenstown is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNTS APPROPRIATED.

By act approved—	
March 3, 1871	$5,000
June 10, 1872	6,000
March 3, 1879	3,000
Total	14,000
By act of June 3, 1896	5,000
Aggregate	19,000

Money statement.

July 1, 1896, balance unexpended	$5,000.00
June 30, 1897, amount expended during fiscal year	3,288.73
July 1, 1897, balance unexpended	1,711.27
July 1, 1897, outstanding liabilities	200.00
July 1, 1897, balance available	1,511.27

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Queenstown Harbor, Maryland, and other localities on Eastern Shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along Eastern Shore of Chesapeake Bay; work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1896.

No detailed commercial statistics could be obtained. The following letter from the president of the Chester River Steamboat Company gives the business of that company for 1896:

BALTIMORE, *June 11, 1897.*

DEAR SIR: We are sorry to have delayed so long the matter of Queenstown statistics, and we are also sorry not to be able to give you the information desired in detail. We hope, however, you can make the information furnished answer your purpose.

Total amount of freight, 1896: Queenstown to Baltimore, 2,562½ tons; Baltimore to Queenstown, 1,593½ tons.

Very respectfully,

GEORGE WARFIELD,
President.

Gen. WM. F. SMITH,
United States Agent.

H 19.

IMPROVEMENT OF ROCKHALL HARBOR AND INNER HARBOR AT ROCKHALL, MARYLAND.

The river and harbor act of June 3, 1896, appropriated $9,600 for Rockhall Harbor, for completing improvement in accordance with report submitted by Gen. W. P. Craighill, Corps of Engineers, January 7, 1895; also, $7,000 for improving inner harbor at Rockhall in accordance with report submitted by Chief of Engineers in House Ex. Doc. No. 200, third session Fifty-third Congress.

The report of General Craighill, above referred to, approved the dredging of a cut across Swan Point Bar, at a cost of $9,600. A survey of the inner harbor of Rockhall was made under my direction in 1891, in accordance with the requirements of the river and harbor act of September 19, 1890, and in 1895 a reexamination was made, as the river and harbor act of August 17, 1894, provided again for a survey. The project recommended by me in the report on the survey was for a 10-foot low-water channel 100 feet wide from Swan Creek Inlet to the old pier in the harbor, at an estimated cost of $9,513. This estimate was reduced to $7,134 in the report on the reexamination, which is that referred to in the appropriation act.

No work has heretofore been done at the bar outside or in the inner harbor by the General Government.

A project for the expenditure of the appropriations providing for a cut 80 feet in width across the bar and a cut 100 feet wide for the

channel inside having been approved by the Chief of Engineers, a contract was made, after due advertisement for proposals, with Chester T. Caler, of Norfolk, Va., for the required dredging, at 9½ cents per cubic yard. Dredging under the contract was begun on June 14, 1897, on the 80-foot cut across Swan Point Bar at the 10-foot curve in Swan Creek, and at the end of the month a cut of the approved dimensions had been made for a length of 810 feet. The material was quite hard, and the work therefore proceeded slowly. On the inner harbor dredging was begun on June 17, 1897, working inward, and at the end of the month a cut had been made of the approved dimensions for a length of 1,300 feet; a further length of 400 feet had been made 50 feet wide, and a further length 200 feet 25 feet wide, the depth being 10 feet at mean low water. The material dredged, 22,045 cubic yards of sand, clay, shells, and mud, was scowed away and deposited in shoal water on the west side under Swan Point Bar, below Huntingfield Point.

It is expected that this improvement will be completed in a few months.

Rockhall is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1897, is $2,361,264.39.

AMOUNT APPROPRIATED.

By act of June 3, 1896	$16,600.00

Money statement.

July 1, 1896, balance unexpended		$16,600.00
June 30, 1897, amount expended during fiscal year		699.10
July 1, 1897, balance unexpended		15,900.90
July 1, 1897, outstanding liabilites	$2,000.00	
July 1, 1897, amount covered by uncompleted contracts	13,000.00	
		15,000.00
July 1, 1897, balance available		900.90

Abstract of proposals received by Gen. William F. Smith, United States agent, and opened December 2, 1896, for dredging in Rockhall Harbor and inner harbor at Rockhall, Md., and other localities on the eastern shore of Chesapeake Bay, Maryland.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Delaware Construction Co., Wilmington, Del	Apr. 1, 1897	Apr. 1, 1898	16
2	Frank C. Somers, Camden, N. J	Feb. 10, 1897	July 31, 1898	14.5
3	Chester T. Caler, Norfolk, Va	Jan. 15, 1897	June 30, 1898	9.5
4	Baltimore Dredging Co., Baltimore, Md	Dec. 15, 1896	Dec. 31, 1897	13.7
5	American Dredging Co., Philadelphia, Pa	Apr. 1, 1897	Apr. 1, 1898	17
6	Sanford & Brooks, Baltimore, Md	Dec. 15, 1896	Sept. 15, 1897	19
7	John L. Grim, Philadelphia, Pa	60 days	16 months	22.5

Contract approved January 5, 1897, for this and other works along the eastern shore of Chesapeake Bay; work on the contract to begin about January 15, 1897, and to be completed June 30, 1898. No other contract made or in force.

H 20.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Wrecks in the Upper Christiana River, Delaware.—On the 2d of January, 1896, obstructions were reported in the Christiana River between Newport and Smalley's Dam. Upon examination it was found

that besides snags and shoals there were seven wrecks of vessels which obstructed navigation between the points named. The channel had not been used for navigation as far as Smalley's Dam for many years, and the question presented itself whether under the circumstances it was advisable to remove the wrecks. For the purpose of ascertaining the probable cost proposals for removing them were advertised for and opened June 26, 1896. The matter was under consideration at the close of last fiscal year.

As the river and harbor act of June 3, 1896, appropriated $5,000 for improving the river between Churchman's bridge and Smalley's bridge, it was decided to include the removal of the wrecks lying between the points named with the general work of improvement to be done there. During the progress of this work, which was closed December 31, 1896, three of the wrecks were removed, leaving two still to be removed should it be determined to make further improvements in this part of the Christiana River. It was also decided to remove the two wrecks below Churchman's bridge, one lying about 2,400 feet above the bridge at Newport, and the other opposite the mouth of White Clay Creek, under the provisions of the act of September 19, 1890, and an allotment of $500 was made therefor.

After due advertisement for proposals contract was made with the lowest bidders, Torrance & Idell, of Camden, N. J., who offered to do the work for $274. Operations under the contract were begun on October 9, 1896, and completed November 17, 1896, when both wrecks had been removed and the channel bottom restored to its original condition. The total cost was $444.23.

Wreck of barge Rose Hagen.—On April 7, 1897, it was reported to the Secretary of the Treasury that the tug *Stella*, en route from Port Deposit to Baltimore with a tow, on the evening of April 4, abreast of Sassafras River, ran into an obstruction, knocking a hole into the bow of the tug, and making it necessary to beach her. Under instructions from the Chief of Engineers an examination was made, and the obstruction was found to be the wooden decked barge *Rose Hagen*, of Philadelphia, which was sunk on the night of December 24, 1896, in Chesapeake Bay, abreast of Sassafras River. The vessel was lying fore and aft with the channel in 18 feet of water, on the west side of the main ship channel. The depth of the barge was 9 feet. At the time of the examination referred to a wrecking company was engaged in raising the vessel, and this was accomplished in the early part of May, when the barge was towed away. There were no expenses to the Engineer Department except the cost of the examination, $9.42.

Abstract of proposals for removing two wrecks in Upper Christiana River, Delaware, below Churchmans Bridge, opened by Gen. William F. Smith, United States agent, Wilmington, Del., September 28, 1896.

No.	Name and address of bidder.	Time.		Amount.
		Commence.	Complete.	
1	John J. Williams, Thurlow, Pa	10 days	30 days	$875
2	Torrance & Idell, Camden, N. J	10 days	10 days	274
3	Atlas Dredging Co., Wilmington, Del	3 days	21 days	600
4	Cornelius J. Kelly, Atlantic City, N. J	10 days	30 days	535
5	Frank C. Somers, Camden, N. J	10 days	30 days	900

Contract made with Torrance & Idell.

H 21.

PRELIMINARY EXAMINATION OF ST. JONES RIVER, DELAWARE.

[Printed in House Doc. No. 85, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of July 27, 1896, by William F. Smith, United States agent, major of engineers, United States Army, retired, of the results of a preliminary examination of St. Jones River, Delaware, made to comply with the requirements of the river and harbor act of June 3, 1896.

Major Smith is of opinion that the present and prospective demands of the commerce of this river warrant its improvement, and he estimates that a survey of the river to Dover, the head of navigation, will cost $1,050.

Col. Peter C. Hains, Corps of Engineers, the division engineer, considers the river to be worthy of improvement by the United States to a limited extent, but whether the improvement will be justified depends upon the cost of it and its maintenance, and the cost can only be determined after a survey.

I concur in the views of the division engineer.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., July 27, 1896.

GENERAL: Referring to Department letter of the 16th ultimo, I have the honor to state that the data in this office enable me to report upon St. Jones River, Delaware, a preliminary examination of which is provided for in the river and harbor act of June 3, 1896, and I therefore report upon it as follows:

A project—the original project—for the improvement of this river was made in 1880. It provided for a 3-foot low-water channel 100 feet wide across the bar at the mouth, protected by a jetty, at an estimated cost of $35,000. The project was enlarged in 1884 to include the removal of the shoals in the river to Dover to a depth of 6 feet at mean low water, and it was further modified in 1889 by dispensing with the jetty and substituting banks thrown up along the sides of the cut.

The improvements were begun in 1885 and were completed in 1890, and the result was a 6-foot low-water channel inside the river, nowhere less than 40 feet wide, and a channel of the same depth and 100 feet wide across the flats at the mouth, the total amount expended being $40,000.

In 1892 the channel at the mouth had shoaled again at the outer end to 4 feet, and an examination of it having been ordered by the river and harbor act of July 13, 1892, it was recommended that it be redredged where necessary to its original depth, 6 feet.

The river and harbor act of August 17, 1894, appropriated $6,500 for the Murderkill River, Delaware, and authorized the expenditure of $1,500 thereof in removing the bar and obstructions at the mouth of the St. Jones River. With this appropriation a cut 60 feet wide and 6 feet deep was made during the summer of 1895 through the shoal portion of the channel at the mouth of the river.

In 1880 it was reported that the business of the river was carried on by 3 vessels of 125 to 150 tons of 6 feet draft; 5 vessels of 30 to 125 tons of 5 feet draft, and a steam tug of 20 tons of 4 feet draft. The value of the commerce was not given.

After the completion of improvements in 1890, commercial statistics furnished to this office stated that 3 vessels—1 steamer and 2 schooners—traded regularly upon the river, and that the total shipments and receipts for that year amounted to 27,777 tons, valued at $1,201,565.

I am of the opinion that the present and prospective demands of the commerce of this river warrant its improvement.

No reliable instrumental survey of the river has ever been made except at the mouth, the original estimate and project having been based upon a rough reconnaissance made with the aid of a county map. The length of the river to Dover, the head of navigation, is about 21 miles. A complete survey of this distance is estimated to cost $1,050.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., July 30, 1896.

Respectfully submitted to the Chief of Engineers, United States Army.

In view of the within statement of the amount of commerce to be benefited, I am of opinion that this river is worthy of improvement by the United States to a limited extent. Whether the improvement will be justified depends upon the cost of it and its maintenance, and the cost can only be determined after a survey.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

H 22.

PRELIMINARY EXAMINATION OF MISPILLION RIVER, DELAWARE.

[Printed in House Doc. No. 110, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated July 27, 1896, by William F. Smith, United States agent, major of engineers, United States Army, retired, of the results of a prelimi-

nary examination of Mispillion River, Delaware, made to comply with the requirements of the river and harbor act of June 3, 1896.

In the opinion of Major Smith the present and prospective demands of commerce of this river warrant its improvement by the General Government, and a survey of the locality is estimated by him to cost $1,000.

Col. Peter C. Hains, Corps of Engineers, the division engineer, concurs in the opinion of the district engineer that the locality is worthy of improvement by the United States, but states that—

> Owing to the character of the river, especially at its mouth, the work of improvement should not be undertaken until a thorough survey furnishes data for a well-digested plan of operations, and to see whether the cost of the improvement would be justified.

I concur in the views of the division engineer.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

HON. DANIEL S. LAMONT,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., July 27, 1896.

GENERAL: Referring to Department letter of the 16th ultimo, I have the honor to state that the data in this office enable me to report upon Mispillion River, Delaware, a preliminary examination of which is provided for in the river and harbor act of June 3, 1896, and I therefore report upon it as follows:

The Mispillion River forms part of the boundary between Kent and Sussex counties, and is a narrow and tortuous stream about 18 miles long, flowing into the Delaware Bay about 17 miles northwest of Cape Henlopen.

It has been under improvement since 1879, on a project for a channel 6 feet deep at mean low water and 40 feet wide from Milford to the mouth. With the exception of a small shoal near the mouth, which required removal to the projected depth, the project had been nearly completed in 1890, and the total amount expended up to that year was $17,000.

A preliminary examination of the obstructions at the mouth was ordered by the river and harbor act of September 19, 1890, and was followed by a survey made in 1891. A project was submitted for their removal by dredging a cut 150 feet wide and 6 feet deep at mean low water across the mud flats, at an estimated cost of $24,000.

This was adopted in 1892, when the first appropriation for it was made. Actual operations were carried on in 1893 and 1895. In the first-named year the project was modified to include, in addition, a pile dike on the north side of the mouth about 500 feet long, and in 1895 a further modification was authorized for the construction of a crib dike 350 feet long from the shore along the south side of the proposed cut, the necessity for both dikes to protect the cut and to concentrate the currents having appeared during the progress of dredging operations, the material removed consisting principally of treacherous live sand.

In 1878 the shipping of Milford consisted of seven schooners from 75 to 150 tons burden. The exports then were estimated at 18,260 tons, valued at $149,000; the imports at 10,433 tons, valued at $113,000.

Commercial statistics furnished for the past year give for the exports 26,481 tons, valued at $458,155, and for the imports 29,808 tons, valued at $377,840.

I am of the opinion that the present and prospective demands of the commerce of this river warrant its improvement by the General Government.

No accurate instrumental survey of this river has ever been made except at the mouth, the original estimates and projects for the improvement inside the river having been based upon a rough reconnoissance made with the aid of a county map. The distance between the mouth and the head of navigation at Milford is about 18 miles. To survey this total length and to make further hydrographic examinations off the mouth will cost $1,000.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 21, 1896.

Respectfully submitted to the Chief of Engineers, United States Army.

I concur in the opinion of the district engineer that the present and prospective demands of the commerce of this river are such that it is worthy of improvement by the United States, but owing to the character of the river, especially at its mouth, the work of improvement should not be undertaken until a thorough survey furnishes data for a well-digested plan of operations, and to see whether the cost of the improvement would be justified.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

H 23.

PRELIMINARY EXAMINATION OF CEDAR CREEK, DELAWARE.

[Printed in House Doc. No. 79, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated July 6, 1896, by William F. Smith, United States agent, major of engineers, United States Army, retired, of the results of preliminary examination of Cedar Creek, Delaware, made to comply with the requirements of the river and harbor act of June 3, 1896.

It is the opinion of Major Smith, concurred in by Col. Peter C. Hains, Corps of Engineers, the division engineer, and by me, that the locality is not worthy of improvement by the Government.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., July 6, 1896.

GENERAL: Referring to Department letter of the 16th ultimo, I have the honor to state that the data in this office enable me to report upon Cedar Creek, Delaware, a preliminary examination of which is provided for in the river and harbor act of June 3, 1896, and I therefore report upon it, as follows:

An examination of this creek was made in August, 1893, conjointly with other creeks in the immediate vicinity, for a report on an inland waterway connecting the Mispillion and Broadkiln rivers. This report was printed in the Report of the Chief of Engineers for 1893, pages 1232 and 1233.

Cedar Creek is in the eastern section of Sussex County, and flows in a northeasterly direction into Delaware Bay, joining the latter about 16 miles northwest of Cape Henlopen light-house. Its length is about 16 miles, of which the lower 4 miles are navigable at high water for small coasting schooners. The average rise of the tide is 4 feet at the mouth and nearly nothing 8 miles above. It may once have been a much more powerful tidal stream than now, but it has lost this power and its capacity to such an extent that about twenty years ago its original outlet, which was situated $1\frac{3}{4}$ miles south of the present one, was nearly closed by sand rolled in by the waves of the bay. To avoid this sandy foreshore, the adjoining landowners and others interested in the few vessels sailing upon the creek had a canal dug about seventeen years ago, at an expense of $3,000, from a point in the creek 2 miles above the original outlet, running in a north-northeasterly direction for a distance of nearly 2 miles toward the mouth of Mispillion River, entering the bay south of and within a few hundred feet of this river. The canal is about 25 feet wide, and at high water about 5 feet deep, and it is hardly possible that in any of the portions of the creek above the canal the width and depth are greater.

Statistics furnished by one of the vessel owners name three schooners, drawing 5 feet of water, that regularly sail in and out of the creek, and others not named as occasionally going there. The principal landing is at Davis's wharf, 4 miles above the mouth. It is stated that the total shipments and receipts from and to the creek amounted last year to 1,905 tons, valued at $51,900. Judging from analogous cases in Delaware, it is questionable whether the present exceedingly small commerce on this creek would sufficiently expand in the future to warrant the great outlay of money that would be required if improvements should be made therein by the General Government. I do not know what improvement is desired, but assuming it to be a channel of the smallest dimensions for the schooners that are reported to ply in it, say 40 feet wide and 3 feet deep at mean low water, the amount of dredging necessary inside the creek would be very large, and it would still leave

the entrance unimproved, which is at present obstructed by shallow mud flats extending for more than a mile into Delaware Bay.

I therefore report that I do not think the present or prospective commerce of Cedar Creek justifies its improvement by the Government.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., July 7, 1896.

Respectfully submitted to the Chief of Engineers. I concur in the opinion of the district engineer that Cedar Creek, Delaware, is not worthy of improvement by the Government.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

H 24.

SURVEY OF LA TRAPPE RIVER, MARYLAND.

[Printed in House Doc. No. 114, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: The river and harbor act of June 3, 1896, provided for a survey of La Trappe River, Maryland, and I have the honor to submit the accompanying copy of report of September 22, 1896, by William F. Smith, United States agent, major of engineers, United States Army, retired, upon the subject.

Work on this river has been carried on by the United States under a project, submitted to Congress in 1891, to secure a channel 11 feet deep at mean low water and 150 feet wide across the bar at the mouth, and to give a channel not less than 75 feet wide and 8 feet deep at mean low water in the river to Trappe Landing, at the head of navigation. Major Smith reports that this project has been completed, with the exception of the channel across the bar, where a length of about 1,200 feet needs widening by about 50 feet, for which he has submitted an estimate, amounting to $2,500, in his annual report upon this work for the fiscal year ending June 30, 1896.

Major Smith further states that—

A survey just completed shows that the channel dredged in the river and across the bar has maintained itself. I am not aware of any interests that seek an enlargement of the channel, and as the present and prospective demands of commerce seem to be provided for, I have made no survey for an increased width or depth.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

HON. DANIEL S. LAMONT,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., September 22, 1896.

GENERAL: In relation to the survey of La Trappe River, Maryland, for which provision is made by the river and harbor act of June 3, 1896, I have the honor to report that a survey was made in 1891, the report upon which will be found on pages 1216–1218 of the Annual Report of the Chief of Engineers for 1891. The project therein recommended was for a channel 11 feet deep at mean low water and 150 feet wide across the bar at the mouth, and to give a channel not less than 75 feet wide and 8 feet deep at mean low water in the river to Trappe Landing at the head of navigation. This project was completed last November, with the exception of the channel across the bar, where a length of about 1,200 feet needs widening by about 50 feet, at an estimated cost of $2,500.

A survey just completed shows that the channel dredged in the river and across the bar has maintained itself. I am not aware of any interests that seek an enlargement of the channel, and as the present and prospective demands of commerce seem to be provided for, I have made no survey for an increased width or depth.

All that is needed is the dredging at the bar above referred to, and for which $2,500 is estimated in my report on La Trappe River for 1896.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

H 25.

SURVEY OF CAMBRIDGE HARBOR, MARYLAND.

[Printed in House Doc. No. 119, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: The river and harbor act of June 3, 1896, provides for a survey of Cambridge Harbor, Maryland, and I have now the honor to submit the accompanying copy of report of September 25, 1896, of the results of this survey, by William F. Smith, United States agent, major of engineers, United States Army, retired.

Work of improving this harbor has heretofore been carried on under a project submitted in 1871, extended in 1887, and completed in 1895, and Major Smith is of the opinion that the improvements made, if maintained and somewhat enlarged, will be sufficient for the present and prospective demands of commerce. A project is therefore submitted by him on those lines at an estimated cost of $8,120.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., September 25, 1896.

GENERAL: Referring to Department instructions of the 5th instant, I have the honor to submit the following report on the survey of Cambridge Harbor, Maryland, which is provided for in the river and harbor act of June 3, 1896:

A survey of Cambridge Harbor was made in 1887, and the report thereon will be found on pages 853 and 854 of the Annual Report of the Chief of Engineers for that year. The project based upon that survey was completed last year, and provided for a channel 12 feet deep from the Choptank River to the railroad wharf, 10 feet to the drawbridge, and 8 feet above that to the head of the wharfage, with a continuous width of not less than 150 feet.

As the law merely authorizes a survey, with no indication as to its object or extent, and as I believe that the improvements heretofore made, if maintained and somewhat enlarged, will be sufficient for the present and prospective demands of commerce, I have confined the present survey mainly to an examination of the channel heretofore dredged. The results of the survey are indicated in the tracing* which I inclose herewith. It shows also the improvements which are recommended by me. These are for a 12-foot low-water channel 150 feet wide from the 12-foot curve in the Choptank River to a point 500 feet outside the Baltimore, Chesapeake and Atlantic Railroad Company's steamboat wharf, and from this point gradually widening to the harbor line at the wharf; from the steamboat wharf to Mill wharf to increase the width an average of 200 feet with a depth of 8 feet, making an anchorage basin; increasing the width of the lower harbor 40 feet on the north side and widening the upper harbor an average of 360 feet along the channel already dredged, to a depth of 8 feet.

It is estimated that these improvements will require the dredging of 40,600 cubic yards of material, which, at, say, 20 cents, will cost $8,120. Of this quantity, 11,000 yards cover shoaling below the bridge, where the channel was last dredged in 1893, and 17,000 yards for new work below the bridge, and 12,600 for new work above the bridge.

I regard this work as worthy of being undertaken by the General Government and that it is justified by the interests of the commerce in the harbor.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

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* Not printed.

APPENDIX I.

IMPROVEMENT OF PATAPSCO RIVER AND BALTIMORE HARBOR, MARYLAND.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Patapsco River and channel to Baltimore, Maryland.
2. Channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland.
3. Harbor of Southwest Baltimore (Spring Garden), Maryland.
4. Removing sunken vessels or craft obstructing or endangering navigation.

SURVEYS.

5. Survey of Baltimore Harbor, Maryland.
6. Survey of Annapolis Harbor, Maryland.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., July 10, 1897.

GENERAL: I have the honor to forward herewith the annual reports for the year ending June 30, 1897, for the works of improvement of rivers and harbors in my charge.

* * * * * * *

Very respectfully, your obedient servant,

PETER C. HAINS,
Colonel, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

I 1.

IMPROVEMENT OF PATAPSCO RIVER AND CHANNEL TO BALTIMORE, MARYLAND.

The act of Congress of September 19, 1890, authorized contracts for the completion of the project making the channel 27 feet deep at mean low water with a width of 600 feet. This work was completed by contract December 6, 1892.

The channel has been maintained with appropriations amounting to $100,000.

Four hundred thousand dollars was appropriated by the river and harbor act of June 3, 1896. The Secretary of War used the discretion

granted by the act to inaugurate a project for a channel 30 feet in depth at mean low water, 600 feet wide at bottom generally, and over 1,200 feet at the bends, estimated to cost $2,500,000 to complete and $50,000 annually thereafter for maintenance.

After rejecting proposals under one advertisement, a contract was made under another, with the Virginia Dredging Company, to remove about 5,000,000 cubic yards, by making a cut not less than 30 feet deep and as wide as the funds will permit, in the middle of the existing channel, from Fort McHenry to deep water in the Chesapeake Bay. The dredging was commenced December 8, 1896, with a small plant, gradually increased to a fair one, which is working night and day with a view to the early completion of the contract. The contract time for completion is June 30, 1898. Up to June 30, 1897, 1,270,582 cubic yards have been removed, leaving 3,729,418 cubic yards yet to be taken out. The greater part of the material to be removed is soft, but near the easterly end of the Fort McHenry Channel, and a considerable part of the Cut-off Channel, the material is very hard, so hard that the ordinary clam-shell dredge can not dig it. The Virginia Dredging Company has put on the work the dredge *Kennedy*, a large machine built on the end-less-chain principle, such as is used to a greater or less extent in excavating hard material in the St. Lawrence River. She has only within the last few days reached the hard material in the Cut-off Channel where she has been working, and no data can yet be given as to her capacity to remove this hard material based on actual operations; but it is confidently expected that she will accomplish the task of removing this hard material with no more difficulty than is found in removing the soft.

Money statement.

July 1, 1896, balance unexpended		$454,875.83
June 30, 1897, amount expended during fiscal year		72,149.06
July 1, 1897, balance unexpended		382,726.77
July 1, 1897, outstanding liabilities	$500.00	
July 1, 1897, amount covered by uncompleted contracts	337,575.71	
		338,075.71
July 1, 1897, balance available		44,651.06
Amount (estimated) required for completion of existing project		2,100,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		800,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

The following are the amounts and dates of appropriations for improving harbor at Baltimore, Md., iucluding Patapsco River:

August 30, 1852	$20,000	March 3, 1879	$160,000
August 15, 1856	100,000	June 14, 1880	100,000
June 28, 1864	20,000	March 3, 1881	150,000
June 23, 1866	5,200	August 2, 1882	450,000
March 3, 1867	75,000	July 5, 1884	250,000
July 25, 1868	17,000	August 5, 1886	150,000
April 10, 1869	26,730	August 11, 1888	300,000
July 11, 1870	42,900	September 19, 1890	340,000
March 3, 1871	50,000	March 3, 1891	151,200
June 10, 1872	100,000	August 5, 1892	208,000
March 3, 1873	200,000	August 18, 1894	50,000
June 23, 1874	75,000	June 3, 1896	400,000
March 3, 1875	75,000	June 3, 1896	50,000
August 14, 1876	75,000		
June 18, 1878	75,000	Total	3,716,030

Abstract of proposals for dredging in channel leading to harbor at Baltimore, Md., opened at United States Engineer Office, Baltimore, Md., at 12 m. October 1, 1896.

No.	Name and address of bidder.	Craighill Channel, 1,395,000 cubic yards.		Cut-off Channel, 963,000 cubic yards.		Brewerton Channel, 1,066,500 cubic yards.	
		Per cubic yard.	Amount.	Per cubic yard.	Amount.	Per cubic yard.	Amount.
		Cents.		*Cents.*		*Cents.*	
1	Virginia Dredging Co., Richmond, Va...	$9\frac{7}{10}$	$135,315.00	.....	.....	$9\frac{7}{10}$	$103,450.50
2	American Dredging Co., Philadelphia, Pa	$6\frac{3}{10}$	86,490.00	$15\frac{3}{10}$	$150,228.00	$7\frac{3}{10}$	76,788.00
3	Baltimore Dredging Co., Baltimore, Md .	.....	.....	.....	.....	.....	.....
4	Sanford & Brooks, Baltimore, Md	.....	.....	.....	.....	.....	.....
5	Rittenhouse R. Moore, Mobile, Ala	6	83,700.00	$10\frac{1}{2}$	101,115.00	8	85,320.00

No.	Name and address of bidder.	Fort McHenry Channel, 1,075,500 cubic yards.		Total.	Alternate proposals for whole work, 4,500,000 cubic yards.	
		Per cubic yard.	Amount.		Per cubic yard.	Total.
		Cents.			*Cents.*	
1	Virginia Dredging Co., Richmond, Va ...	$9\frac{7}{10}$	$104,323.50	.....	$10\frac{7}{10}$	$481,500.00
2	American Dredging Co., Philadelphia, Pa	$8\frac{7}{10}$	93,568.50	$407,074.50	.....	.....
3	Baltimore Dredging Co., Baltimore, Md..	.....	.....	.....	$8\frac{7}{8}$	399,375.00
4	Sanford & Brooks, Baltimore, Md.....	.....	.....	.....	$8\frac{73}{100}$	392,850.00
5	Rittenhouse R. Moore, Mobile, Ala	10	107,550.00	377,685.00	8	360,000.00

Bids rejected and work readvertised.

Abstract of proposals for dredging in channel leading to harbor at Baltimore, Md., opened at United States engineer office, Baltimore, Md., at 12 m. October 26, 1896.

No.	Name and address of bidder.	5,000,000 cubic yards.	
		Price per cubic yard.	Total.
		Cents.	
1	Morris & Cummings Dredging Co., New York City.....	$8\frac{9}{10}$	$445,000
2	American Dredging Co., Philadelphia, Pa.....	$8\frac{84}{100}$	442,000
3	Baltimore Dredging Co., Baltimore, Md.....	$8\frac{3}{4}$	437,500
4	Elijah Brainard, New York City.....	10	500,000
5	Virginia Dredging Co., Richmond, Va.....	$7\frac{98}{100}$	399,500

Contract awarded to Virginia Dredging Company, Richmond, Va.

Abstract of proposals for building a steam tender, opened at United States engineer office, Baltimore, Md., at 12 o'clock, noon, November 30, 1896.

[Appropriation: Improving harbor at Baltimore, Md.]

No.	Name and address of bidder.	Time to—		Price.	Remarks.
		Commence.	Complete (4 months from date of contract).		
1	RobertM. Spedden Co., Baltimore, Md.	.....	In 4 calendar months after date of contract.	$24,873	Different from specifications by having 19-foot beam and 10-foot depth of hold.
2	E. J. Codd Co., Baltimore, Md.	10 days from acceptance of contract.	.....do	{23,480 {21,700	Steel hull. Wood hull.
3	Pusey & Jones Co., Wilmington, Del.	Receiving contract.	.....do	28,900	
4	Geo. Lawley & Son, corporation, City Point, South Boston, Mass.	Signing of the contract.	.....do	24,300	No guaranty.
5	John H. Dialogue, Camden, N. J.	.....	.....do	26,000	$29,500 for different arrangement, and $28,400 for another arrangement.
6	Hugh Ramsay, Perth Amboy, N. J.	.....	.....do	33,110	
7	Detroit Boat Works, Detroit, Mich.	Acceptance of contract.	.....do	21,310	

Bids rejected and work readvertised.

Abstract of proposals for building a steel-hull tugboat, opened at United States engineer office, Baltimore, Md., at noon of February 16, 1897.

[Appropriation: Improving harbor at Baltimore, Md.]

No.	Name and address of bidder.	Price bid.	Date of delivery.	Days short of 4 months for delivery.	Deduction for early delivery.	Comparison of bids under paragraph 70, specifications. Amount of bid with deduction of $25 per day for early delivery.	Days over 4 months for delivery.	Remarks.
1	E. J. Codd Co., Baltimore, Md.	$28,187	July 31, 1897.....	.....	.....	.....	33	Rejected for overtime. See paragraph 70, specifications.
2	Jno. H. Dialogue & Son, Camden, N. J.	25,940	3½ calendar months after signing contract.	15	$375	$25,565	.....	
3	R. M. Spedden Co., Baltimore, Md.	24,497	In 4 calendar months after award of contract.	.....	.....	24,497	.....	

Contract with R. M. Spedden Co.

The following contracts were in force during the fiscal year: With the Virginia Dredging Company, for dredging, approved December 11, 1896, commenced December 8, 1896, to be completed June 30, 1898; with R. M. Spedden Company, for building a steam vessel, approved March 10, 1897, commenced in February, 1897, to be completed July 9, 1897.

COMMERCIAL STATISTICS.

Commercial statistics of the port of Baltimore, Md., comparing the fiscal years ending June 30, 1896 and 1897.

[Compiled for the use of Col. Peter C. Hains, Corps of Engineers.]

Value of imports.

1897 (free)	$5,856,446.38
1896 (free)	6,255,755.00
Decrease in 1897	399,308.62
1897 (dutiable)	5,514,352.87
1896 (dutiable)	7,221,379.00
Decrease in 1897	1,707,026.13

RECAPITULATION OF IMPORTS.

1897 (free)	5,856,446.38
1897 (dutiable)	5,514,352.87
Total	11,370,799.25
Total, 1896	13,477,134.00
Total decrease in 1897	2,106,334.75
Imports in American vessels in 1897:	
Sailing	2,183,261.00
Steam	238,522.00
Imports in foreign vessels in 1897:	
Sailing	364,807.00
Steam	8,582,499.25
Imports in cars overland	1,710.00
Total	11,370,799.25

Value of domestic exports.

1897	$85,658,564.00
1896	66,365,773.00
Increase in 1897	19,292,791.00
Exported in American vessels in 1897:	
Sailing	1,266,385.00
Steam	454,700.00
Exported in foreign vessels in 1897:	
Sailing	58,373.00
Steam	83,879,106.00
Total exports in 1897	85,658,564.00

RECAPITULATION OF EXPORTS.

In American vessels, 1897	$1,721,085.00
In foreign vessels, 1897	83,937,479.00

Certain articles exported.

Articles.	Tons.	Articles.	Tons.
Cattle	48,057	Lubricating oil	2,951
Corn	1,006,396	Canned beef	3,628
Oatmeal	3,913	Fresh beef	4,677
Wheat	173,096	Salt beef	8,209
Flour	234,106	Tallow	3,241
Coal	56,833	Bacon	14,206
Copper ingots	38,894	Hams	879
Cotton (unmanufactured)	37,780	Salt pork	2,799
Dried apples	1,879	Lard	36,981
Grape sugar	7,564	Oleomargarine oil	13,158
Ferromanganese	4,908	Starch	7,964
Iron, and manufactures of	16,799	Leaf tobacco	36,412
Lead bars, etc	2,694	Tobacco stems	2,475
Oil cake	57,623	Rosin	7,045
Paraffine wax	2,251	Wood, and manufactures of	161,157
Illuminating oil	144,777		

Transportation in bond with appraisement.

Destination.	Value.	Duty.	Destination.	Value.	Duty.
Buffalo	$259	$339.54	Philadelphia	$6,806	$10,151.50
Chicago	629	332.93	Rochester	180	140.35
Cincinnati	3,234	3,045.11	St. Louis	900	1,119.95
Hartford	933	795.46	Washington	1,195	635.00
Mobile	648	451.94			
New York	59,552	63,315.87	Total	83,421	83,390.10
Peoria	9,085	3,062.45			

Transportation in bond without appraisement.

Destination.	Value.	Bond.	Destination.	Value.	Bond.
Atlanta	$24	$8.40	Minneapolis	$11,996	$4,310.95
Buffalo	606	606.00	New York	26,291	51,325.00
Boston	40,385	80,770.00	Nashville	2,630	4,680.00
Cincinnati	190,131	251,236.44	Omaha	1,302	4,680.00
Chicago	445,887	371,398.55	Philadelphia	167,925	287,768.75
Cleveland	144,020	72,920.80	Pittsburg	15,526	14,170.50
Columbus	18,305	8,886.90	Providence	35,116	70,232.00
Detroit	24,743	12,528.00	Richmond, Va	1,506	1,005.60
Dubuque	4,574	2,057.00	St. Louis	704,568	622,929.98
Des Moines	1,321	462.35	St. Paul	15,398	5,389.30
Erie	2,827	5,654.00	St. Joseph	956	334.60
Evansville	3,913	1,369.55	San Francisco	6,652	11,904.00
Grand Rapids	9,881	3,462.35	Savannah	1,094	1,094.00
Indianapolis	133,004	83,545.10	Sandusky	1,749	1,749.00
Kansas City	56,959	53,577.35	Toledo	32,634	19,648.20
Louisville	116,640	201,279.89	Wilmington, N. C	97	194.00
Los Angeles	181	64.90	Washington	30,359	47,179.35
Milwaukee	18,178	7,265.85			
Memphis	1,012	1,800.00	Total	2,268,390	2,307,488.66

Summary of merchandise transported in bond without appraisement.

Year.	Value.	Bond.
1896	$2,009,021	$1,990,001.10
1897	2,268,390	2,307,488.66
Increase in 1897	259,369	317,487.56

Amount of duties collected in 1897	$2,283,336.98
Miscellaneous customs receipts in 1897	77,927.41
Total receipts in 1897	2,361,264.39
Total receipts in 1896	2,825,586.39
Decrease in 1897	464,322.00
Duties on merchandise in bond in 1897	198,444.92
Duties on merchandise in bond in 1896	451,782.67
Decrease in 1897	253,337.75

Summary of duties collected in 1897.

Imports and miscellaneous customs receipts	$2,361,264.39
Merchandise, in bond	198,444.92
Merchandise transported, with appraisement	83,390.10
Total	2,643,099.41

STATISTICAL RECAPITULATION.

Dutiable imports have decreased	$1,707,026.13
Free imports have decreased	$399,308.62
Domestic exports have increased	$19,292,791.00
Tonnage, foreign and coastwise, has increased ..... tons..	1,504,226
Decrease in duties collected	$472,519.15
Decrease in duties on merchandise in bond	$253,337.75
Increase in duties on merchandise in bond, with and without appraisement	$347,242.10

Tonnage movement.

Vessels.	Entered.		Cleared.	
	1895–96.	1896–97.	1895–96.	1896–97.
American:				
Sail	36,629	48,001	45,847	50,863
Steam	13,234	21,823	12,583	17,375
Foreign:				
Sail	11,232	15,752	4,424	3,445
Steam	833,998	1,168,736	1,002,847	1,447,714
Total	895,093	1,254,312	1,065,701	1,519,397

	Foreign.		Coastwise.	
	1895–96.	1896–97.	1895–96.	1896–97.
Inward	895,093	1,254,312	1,475,106	1,947,198
Outward	1,065,701	1,519,397	1,927,994	2,147,213

	Tons.
Vessels entered in 1897	1,254,312
Vessels cleared in 1897	1,519,397
Total foreign in 1897	2,773,709
Total foreign in 1896	1,960,794
Vessels entered coastwise in 1897	1,947,198
Vessels cleared coastwise in 1897	2,147,213
Total coastwise in 1897	4,094,411
Total coastwise in 1896	3,403,100
Total foreign tonnage, in and out, 1897	2,773,709
Total coastwise tonnage, in and out, 1897	4,094,411
Total tonnage in 1897	6,868,120
Total tonnage in 1896	5,363,894

Vessels built.

	Number.	Gross tonnage.	Net tonnage.
Steam	5	630.28	419.09
Sail	36	2,522.51	2,185.02
Total	41	3,152.79	2,604.11

Number of immigrant passengers arrived.

Year.	Male.	Female.	Total.
1896–97	3,502	2,908	6,410
1895–96	9,175	5,483	14,658

Established lines of steamships.

Name.	Number of vessels.	Tonnage.	Destination.
Johnson Line	9	28,673	Liverpool.
Atlantic Transport Line	8	17,404	London.
North German Lloyd Line	13	40,894	Bremen.
Neptune Line	7	13,086	Rotterdam.
Donaldson Blue Cross Line	7	16,384	Glasgow.
Lord Line	7	12,283	Dublin.
Hamburg-American Line	25	57,930	Hamburg.
Puritan Line	5	9,581	Antwerp.
Empire Line	8	14,338	Leith.
Blue Cross Line	4	6,288	Havre.
Hammonia Line	7	9,991	Brazil.
Earn Line	9	14,040	West Indies.
Lamport & Holt Line	13	18,473	Brazil.
Buckman Line	6	2,671	Jamaica.
Monumental Trading Co	2	848	Do.
Total	130	262,884	

The following lines have been added to the number of vessels heretofore reported:

Lord Line	2	Empire Line	4
Puritan Line	2	Buckman Line	1
Lamport & Holt Line	1		
Hamburg-American Line	9	Total	19

The following lines have reduced the number of vessels heretofore reported:

Neptune Line	1
Hammonia Line	1
Donaldson Blue Cross Line	1

The following lines have been withdrawn:

Johnson Line, to Tampico	3
Monumental Fruit Company, to Jamaica	1

The following lines have been established:

Monumental Trading Company, to Jamaica	2

The tonnage movement for the fiscal year ended June 30, 1897, shows an increase of 42 per cent over that of the preceding year. There are now 15 established lines of steamships trading at this port, representing 130 vessels, having an aggregate carrying capacity of 4,206,014 tons, and having an average draft of 22 feet of water.

Very respectfully, yours,

FRANK T. SHAW, *Collector.*

Col. PETER C. HAINS,
Corps of Engineers, U. S. A.

I 2.

IMPROVEMENT OF CHANNEL TO CURTIS BAY, IN PATAPSCO RIVER, BALTIMORE HARBOR, MARYLAND.

The river and harbor act of 1892 contained the following item:

Improving Patapsco River, Baltimore Harbor, Maryland: For dredging a channel one hundred and fifty feet wide at bottom and of a depth of twenty-seven feet mean low water from the main ship channel to Curtis Bay, in accordance with recommendation of Col. William P. Craighill, Corps of Engineers, submitted December thirteenth, eighteen hundred and ninety, twenty-eight thousand dollars.

The total estimated cost of the improvement was $85,000. The above appropriation was expended in dredging, by contract, a channel 150 feet wide to a depth of 25 feet at mean low water, which was completed in May, 1893.

he Chief of Engi
Annual Report.
ding June 30
Colonel, Co

An appropriation of $12,000 was made August 17, 1894, but the channel already dredged answers all present needs, and it has been decided to hold the new appropriation until its expenditure is required.

Money statement.

July 1, 1896, balance unexpended	$12,000.00
July 1, 1897, balance unexpended	12,000.00
Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	45,000.00

The following are the amounts and dates of appropriations for improving channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland:

July 13, 1892	$28,000
August 17, 1894	12,000
Total	40,000

I 3.

IMPROVEMENT OF HARBOR OF SOUTHWEST BALTIMORE (SPRING GARDEN), MARYLAND.

The river and harbor act of June 3, 1896, contained the following item:

Improving harbor of Southwest Baltimore (Spring Garden), Maryland, in accordance with report submitted March seventh, eighteen hundred and ninety-six, for constructing channel one hundred feet wide on the bottom, five thousand dollars.

The report referred to in the act is to be found printed in House Doc. No. 304, Fifty-fourth Congress, first session, and on pages 1006–1007, Annual Report of the Chief of Engineers for the fiscal year ending June 30, 1896.

The total estimated cost of the improvement was $314,000.

There were no operations in the year ending June 30, 1897.

Money statement.

Amount appropriated by act of June 3, 1896	$5,000.00
July 1, 1897, balance unexpended	5,000.00
Amount (estimated) required for completion of existing project	309,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following is the amount and date of appropriation for improving harbor of Southwest Baltimore (Spring Garden), Md:

June 3, 1896	$5,000

I 4.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Schooner Margaret Kennedy.—This vessel, loaded with lime, grounded and wrecked off Fort McHenry, in Baltimore Harbor, Maryland, in the summer of 1895, and was a dangerous obstruction to the navigation of the small craft of the Chesapeake Bay and tributaries, beating in and

out of the harbor. After circular letter and poster advertisement, the wreck was entirely removed by exploding dynamite under it and carrying the pieces ashore. The removal was completed February 24, 1897, at a cost of $125, with funds allotted from the appropriation for removing sunken vessels or craft obstructing or endangering navigation.

I 5.

SURVEY OF BALTIMORE HARBOR, MARYLAND, WITH A VIEW TO SECURING A CHANNEL 30 FEET IN DEPTH.

[Printed in House Doc. No. 50, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of October 17, 1896, by Col. Peter C. Hains, Corps of Engineers, prepared under the requirements of the river and harbor act of June 3, 1896, which provides for survey of Baltimore Harbor, Maryland, with a view to securing a channel 30 feet in depth.

Colonel Hains estimates that to deepen the channel to 30 feet at mean low water, with a bottom width of 600 feet and side slopes of 3 base to 1 vertical, will cost $2,500,000. To maintain the channel after completion will require an annual expenditure of $50,000.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., October 17, 1896.

GENERAL: In compliance with the directions contained in your letter dated September 5, 1896, I have the honor to submit the following report on the survey of "Baltimore Harbor, Maryland, with a view to securing a channel thirty feet in depth," provided for by the river and harbor act of June 3, 1896.

The same law contained the following item:

> Improving deep channel in Baltimore Harbor, Maryland, in accordance with the project submitted December first, eighteen hundred and ninety-four, four hundred thousand dollars: *Provided*, That this sum may be used in the discretion of the Secretary of War, under the direction of the Chief of Engineers, for deepening the present channel to a depth of thirty feet.

A survey of the channel and the river and bay adjacent was made after finishing the 27-foot project, and the maps of it were completed in May, 1895. These maps furnish sufficient data to prepare a project under the law quoted above to deepen the channel to 30 feet at mean low water, with a bottom width of 600 feet and side slopes of 3 base to 1 vertical. Such a project was submitted, and was approved by the honorable Secretary of War The estimated cost of the project is

$2,500,000, and provides for an annual expenditure of $50,000 to maintain it after completion. Specifications have been prepared, and proposals invited for the expenditure of the appropriation made by the law, in deepening the channel to 30 feet for such width as the available funds will permit, and no further survey is necessary at this time.

Very respectfully, your obedient servant,

PETER C. HAINS,
Colonel, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

I 6.

SURVEY OF ANNAPOLIS HARBOR, MARYLAND.

[Printed in House Doc. No. 57, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 4, 1896.

SIR: The river and harbor act of June 3, 1896, provides for a survey of Annapolis Harbor, Maryland, as follows:

Annapolis Harbor, with a view to straightening, widening, and deepening the channel of the entrance to said harbor, so as to obtain a ship's channel of one hundred and fifty feet wide and twenty-eight feet deep at mean low water, from Chesapeake Bay to the wharves of the United States Naval Academy in said harbor.

The duty of making this survey was assigned to Col. Peter C. Hains, Corps of Engineers, and I have now the honor to submit the accompanying report upon the subject by that officer, dated November 28, 1896.

Colonel Hains states that there can be no question that the only practical way to improve the navigation in the manner required by the act is to dredge a channel from the deep water of the bay to the inner harbor, and estimates that to dredge a channel 3½ miles long, with side slopes 1 on 3 and 28 feet deep at mean low water, will cost $142,000.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., November 28, 1896.

GENERAL: The river and harbor bill of June 3, 1896, contains the following:

Annapolis Harbor, with a view to straightening, widening, and deepening the channel of the entrance to said harbor so as to obtain a ship's channel of one hundred and fifty feet wide and twenty-eight feet deep at mean low water, from Chesapeake Bay to the wharves of the United States Naval Academy in said harbor.

This survey was assigned to me by your order of July 24, 1896.

The several surveys of this harbor that are in existence made it unnecessary to do anything more than to study the physical conditions, with a view to obtaining the best means of obtaining the results called for, viz, the straightening, widening, and deepening to obtain a ship channel 150 feet wide and 28 feet deep at mean low water.

The necessary examinations and study of the physical conditions were assigned to Lieut. Charles W. Kutz, Corps of Engineers, whose report is herewith.

There can be no question that the only practical way to improve the navigation in the manner required by the act is to dredge a channel from the deep water of the bay to the inner harbor on the lines approximately laid down by Lieutenant Kutz. I concur in the view expressed by him, and estimate that to dredge a channel 3½ miles long, with side slopes 1 on 3 and 28 feet deep at mean low water, will cost the sum of $142,000.

Very respectfully, your obedient servant,

PETER C. HAINS,
Colonel, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF LIEUT. CHARLES W. KUTZ, CORPS OF ENGINEERS.

BALTIMORE, MD., *November 5, 1896.*

COLONEL: Pursuant to your verbal directions, I have the honor to submit the following report, based upon that clause of the river and harbor bill of June 3, 1896, which directs a "survey to be made and the cost of the improvement to be estimated at Annapolis Harbor, Maryland, with a view to straightening, widening, and deepening the channel of the entrance to said harbor so as to obtain a ship channel of one hundred and fifty feet wide and twenty-eight feet deep at mean low water from Chesapeake Bay to the wharves of the United States Naval Academy in said harbor."

An accurate survey of this harbor was made in 1878 under the direction of Capt. James M. Cuyler, Corps of Engineers, and another in 1888 by the United States Coast Survey Office. The Coast Survey chart, based on the latter survey, has been brought up to date—1896.

With these excellent charts available, it was not considered necessary to make an additional survey, but merely an examination with a view to obtaining such information not contained in the charts as might be necessary for a proper consideration of the subject.

The earliest report in reference to the improvement of this harbor was made by Capt. Charles B. Phillips, Corps of Engineers, October 30, 1876. A portion of his report in reference to the shipping is quoted, because it is the same to-day as it was twenty years ago:

"I find three classes of shipping interested in the navigation of the water approaches to Annapolis: (1) Vessels (mainly of light draft) running regularly to and from the port and carrying the local commerce of the city; (2) coasting and oyster vessels, which use the harbor solely as a point of refuge from ice and inclement weather; (3) deep-draft United States naval vessels."

The next report was made January 4, 1879, by Captain Cuyler, in conjunction with his survey of the harbor. He submitted a project for a 24-foot channel, and his conclusions were as follows:

'If the analysis of existing conditions there as given above be correct, considering the present demands of commerce on this harbor, the method to be pursued to attain the object held in view would seem to me to be that of dredging. It is believed the character of this would be favorable, and for the reasons above quoted but small periodical repairs would be required for a channel once so made.

* * * * * * *

"With the dredging of the proposed channel should go on works for the protection from further abrasion of Greenberry Point to stop the filling in across from it of the made channel, and later on of Horn Point.

"It is not considered advisable to recommend the adoption of any other system of improvement—such, for example, as jetties—to confine the volume of the in and out ward flow to produce scour; certainly, at least, to begin with.

"Jetties, to be effective here, would require a location involving great extent, and, from the exposure, much solidity in construction, so giving a large first cost. It is questionable also whether if properly placed jetties might not seriously interfere with the facilities now enjoyed, and which would be required to a greater extent still in case of an improvement being made here by navigation."

These reports were followed on June 14, 1880, by an appropriation of $5,000 and a law directing an examination of the "bars at the entrance of Annapolis Harbor, with a view to ascertain the character of jetties necessary to render the proposed improvement permanent."

This additional examination was made in October, 1880, by Mr. W. R. Hutton, under the direction of Maj. William P. Craighill, and the following is quoted from the former's report:

"I conclude that the new channel should be laid in a straight line from the closed 24-foot curve between Greenberry and Horn Point bars to that point on the 24-foot curve outside where it turns from the shore to pass around the reef off Tolley Point. To confine this channel between two jetties would be injurious by obstructing the ordinary navigation of the harbor.

"A single jetty on the south side would confine the current more closely and would better maintain the channel. Its length would be very great and its cost out of proportion to the benefits to be obtained. A channel dredged on the line I have described would, in my judgment, maintain itself.

* * * * * * *

"Some dredging will doubtless be required in course of time, but it will be very much cheaper than any works to maintain the channel by scour."

An additional appropriation of $5,000 for this locality was made in March, 1881.

The estimated cost of the improvement was $66,000. As the expenditure of $10,000 would not effect any substantial improvement, it was not deemed expedient to commence operations until further directions were received from Congress. Recommendation to that effect to the Chief of Engineers was approved April 7, 1881. No work was done until toward the close of 1885, when information was received that shoaling had taken place in some portions of the harbor and the freedom of navigation thereby impaired. This was in the vicinity of the Naval Academy wharves, and the work was put under contract and completed in August, 1886, for the sum of $7,244.41. The unexpended balance of the $10,000 was repaid into the Treasury.

On October 19, 1896, I proceeded by tug to Annapolis and made the required examination. The harbor of Annapolis runs southeast to northwest, with a fairly straight ship channel through it 19 feet deep at mean low water. Opposite the Naval Academy wharves there is a deep pocket with a minimum depth of 29 feet, which extends thence to a point due south of the wharf of the naval ordnance proving ground. This deep water is separated from the deep water of the bay by two broad bars, which in turn are separated by a deep-water pocket with 25 feet of water in it. The latter is caused by Greenberry Neck, which projects into the harbor and causes a contraction of the waterway. Greenberry Neck is wearing away very rapidly, probably at the rate of 15 feet a year, 30 feet or 40 feet having disappeared in two recent storms, according to the light-house keeper; consequently, its influence on the channel is lessening each year. As the deep-water pocket now caused by it is only 25 feet deep, it is thought that in the consideration of a 28-foot channel its influence may be disregarded and the whole obstruction regarded as a single bar about 3 miles broad.

If the jetty system were applicable to the improvement of this harbor it might be well to prevent the further abrasion of this neck of land and use it as the starting point of a north jetty, but the excessive cost and the great obstacle they would form to small-craft navigation prohibit jetties. Consequently, it is not considered a necessary part of the improvement of this harbor to protect Greenberry Neck.

Dredging, then, presents itself as the only available means of deepening the ship channel across the bar. To determine the character of the bottom, soundings were made along the most direct route between the deep-water pocket, opposite the Naval Academy and the 20-foot contour of the bay, advantage being taken of the deep-water pocket off Greenberry Point. This channel line is not straight, having one deflection angle in it of about 20 degrees. It also joins the deep water of the Severn obliquely, making another turn of about 30 degrees. The 20-degree turn can be reduced to 8 degrees by turning the outer portion southward and running it along and parallel to the Tolley Point bar. This position was indicated by Mr Hutton in his report. Its disadvantage lies in the fact that it will requíre a channel one-half mile longer than the other, but this, it is thought, will be compensated for by the greater ease in maintaining it, the Tolley Point bar acting in the manner of a training wall.

The soundings were taken with a lead line and the bottom tested by an iron rod. The average mean low-water depth along this line is about 20 feet, but the bottom

is so soft that the mere weight of the iron rod, when dropped from a height of 3 feet or 4 feet, was suffiçent to send it 8 feet or 10 feet into the mud. The only exceptions were at points where oyster beds were encountered, and here a slight thrust would send the rod through this upper crust. The mean rise of the tide is only 0.8 feet, and the direction and velocity of the tidal currents are very much affected by the wind—a strong southerly wind sending the flood tide almost due north until the shoals off Hacketts and Greenberry points deflect it into the harbor. On the contrary, on a calm day the tide follows the channel course. For this reason the tidal ebb and flow would have little influence in maintaining a dredged channel.

On the other hand, the drainage area of the Severn River is comparatively small and the banks well protected, so it is thought that but little sediment is carried into the harbor. There is, however, a tendency to shoal in the vicinity of the Naval Academy wharves, and this, in the opinion of the Superintendent of that institution, is caused by sediment brought down by Dorsey Creek. The deposition is caused partially by the junction of Severn River and Dorsey Creek, and partially by the Santee Wharf, which acts as a groin and prevents the sediment from being carried into the harbor. In some places near the Santee Wharf the depth has been reduced from 18 feet to 12 feet in the last few years.

In order to form a correct idea of any changes that may have taken place in the harbor, a comparative chart was prepared from the records of this office. Four principal charts were consulted. One, dated, 1819, was made by Jonathan W. Sherburne, United States Navy; one, dated 1878, was made under the direction of Capt. James W. Cuyler, Corps of Engineers, and the other two were Coast Survey charts, dated 1844 and 1896. A study of this chart indicates that few changes have taken place in that part of the harbor known as Annapolis Roads, while in the inner harbor the ship channel appears to be growing narrower, due, no doubt, to the wearing away of Horn and Greenberry points, but the condition is almost one of permanence, extending over a period of seventy-seven years.

A dredged channel through such soft material would require easy side slopes, say 1 on 3, and a certain amount of annual dredging for maintenance, but all who have ever examined this harbor agree in recommending dredging as the proper means of improvement.

I would recommend that the outer portion follow a line parallel to the Tolley Point bar, leading 35 degrees west of north. This would make a cut 3½ miles long, and, with side slopes of 1 on 3 and an allowance of 1 foot for filling in behind the bucket, would require 1,070,000 cubic yards of excavation, scow measurement, or 1,070,000 cubic yards, at 12 cents per cubic yard, $128,400. Allowing 10 per cent for contingencies, the estimated cost of the improvement becomes, in round numbers, $142,000. It is thought that an annual appropriation of $5,000 would be ample to maintain such a channel, and possibly it could be maintained for considerably less. In this connection it seems proper to add that the commerce of Annapolis is extremely small, not even the present depth of water in the ship channel (19 feet) being used, as is indicated by the fact that there is only 12 feet of water at the city wharves.

The Naval Academy authorities expressed themselves as rather averse to an increased depth of water over the bar; the present depth (19 feet) being ample for their practice ships, while a busy port, with deep-water approach, would interfere with the policy of seclusion that had always been maintained as essential to the welfare of the Academy.

Very respectfully, your obedient servant,

CHARLES W. KUTZ,
Second Lieutenant, Corps of Engineers.

Col. P. C. HAINS,
Corps of Engineers, U. S. A.

APPENDIX J.

IMPROVEMENT OF POTOMAC RIVER AND ITS TRIBUTARIES, OF JAMES RIVER, VIRGINIA, AND OF CERTAIN RIVERS IN VIRGINIA ON WESTERN SHORE OF CHESAPEAKE BAY. PROTECTION OF JAMESTOWN ISLAND, VIRGINIA.

REPORT OF LIEUT. COL. CHAS. J. ALLEN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Potomac River at Washington, District of Columbia.
2. Occoquan Creek, Virgina.
3. Aquia Creek, Virginia.
4. Nomini Creek, Virginia.
5. Lower Machodoc Creek, Virginia.
6. Rappahannock River, Virginia.
7. Urbana Creek, Virginia.
8. York River, Virginia.
9. Mattaponi River, Virginia.
10. Pamunkey River, Virginia.
11. James River, Virginia.
12. Protection of Jamestown Island, Virginia.

SURVEY.

13. Chapel Point Harbor, Maryland.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., July 19, 1897.

GENERAL: I have the honor to forward herewith my annual reports for the year ending June 30, 1897, on river and harbor works in my charge.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

J 1.

IMPROVEMENT OF POTOMAC RIVER AT WASHINGTON, DISTRICT OF COLUMBIA.

PRESENT PROJECT.

The present project for improvement was adopted by act of Congress of August 2, 1882. It has for its objects the improvement of the navigation of the river by widening and deepening its channels, the recla-

mation of the flats by depositing on them the material dredged from the channels, the freeing of the Washington Channel, so far as it can be done, of sewage, and the establishment of harbor lines beyond which no wharves shall be built.

To accomplish these objects the channels were to be improved so as to have depths of 20 feet at low water. The flats above Long Bridge were to be filled in to a height of 3 feet above the flood plane of 1877; below Long Bridge the middle longitudinal line of the flats was to be filled to the same height, but the fill was to slope thence toward each channel, so as to have a height of 6 feet above low tide at the margins of the fill. In order to purify the water in the Washington Channel, cut off at its upper end from the Virginia or main channel, a tidal reservoir or basin was to be established above Long Bridge not less than 8 feet deep and provided with inlet and outlet gates of ample dimensions, automatically arranged for filling the reservoir on the flood tide from the Virginia Channel and emptying it into the Washington Channel to the level of low water at the ebb. An ample system of drainage for the reclaimed area was to be provided.

The project also provided for the rebuilding of Long Bridge at an early period during the progress of the improvement, with wide spans upon piers offering the least obstruction to the flow of water, and also for the interception of all sewage discharged into the Washington Channel and its conveyance to the James Creek Sewer Canal, but neither of these two works was included in the estimated cost of the improvement, which was $2,716,365. A revision of this estimate, made in 1897, places the cost at $2,953,020. The reasons for this increase will be found in the latter part of this report.

A training dike on the Virginia shore was added in 1890.

The first appropriation for improvement of the Potomac River in accordance with the report and recommendations of the Board of Engineers was by act of Congress of August 2, 1882, and as follows:

> Improving Potomac River in the vicinity of Washington with reference to the improvement of navigation, the establishment of harbor lines, and the raising of the flats, under the direction of the Secretary of War and in accordance with the plan and report made in compliance with the river and harbor act approved March third, eighteen hundred and eighty-one, and the reports of the Board of Engineers made in compliance with the resolution of the Senate of December thirteenth, eighteen hundred and eighty-one, four hundred thousand dollars.
>
> And it is hereby made the duty of the Attorney-General to examine all claims of the title to the premises to be improved under this appropriation and see that the rights of the Government in all respects are secured and protected; and if he deems it necessary, he is authorized to cause a suit or suits in law or in equity to be instituted in the name of the United States, in the supreme court of the District of Columbia, against any and all claimants of title under any patent which, in his opinion, was by mistake or was improperly or illegally issued for any part of the marshes or flats within the limits of the proposed improvement.

In December, 1869, a patent had been issued to John L. Kidwell for certain land in the Potomac River, which land is the so-called "Kidwells Meadows." The second clause in the appropriation for this improvement was instituted to cover this and all similar claims.

The river and harbor act of July 5, 1884, contained no proviso, but that of August 5, 1886, contained the following:

> *Provided*, That no part of the sum hereby appropriated shall be expended upon or with reference to any place in respect of which the title of the United States is in doubt, or in respect to which any claim adverse to the United States has been made.

Congress by another act, August 5, 1886, also provided that the Attorney-General of the United States should institute, as soon as

might be, in the supreme court of the District of Columbia, a suit against all persons and corporations who might have or pretend to have any right, title, claim, or interest in any part of the land or water in the District of Columbia, within the limits of the city of Washington, or exterior to said limits and its front thereof, toward the channel of the Potomac River, and composing any part of the land or water affected by the improvement of the Potomac River or its flats, in charge of the Secretary of War, for the purpose of reestablishing and making clear the right of the United States thereto.

The act provided that the suit should be in the nature of a bill in equity. The act also allowed an appeal from the final decree of the supreme court of the District of Columbia to the Supreme Court of the United States; and also required that, until final decision should have been had, no moneys appropriated for the improvement of the Potomac River within the District of Columbia, the establishment of harbor lines in the District of Columbia, and the raising of the flats therein should be expended otherwise than upon property in respect of which there was no claim adverse to the title of the United States or for the improvement of navigation in the said river.

In accordance with the provisions of this act a bill of complaint and the answers were filed November 26, 1886, in the supreme court of the District of Columbia, holding a special term in equity.

After the date of the act just quoted the work of reclamation and filling was confined to that portion of the flats below the limits of the marsh known as "Kidwells Meadows," except when work was required for the improvement of navigation.

The case finally came up in the supreme court of the District of Columbia in general term, April 22, 1895, the United States, by proceedings in equity, seeking to quiet the alleged title of about forty different claimants to land on the flats above the Long Bridge and to certain tracts of land along the river front from about Easbys Point to the Arsenal Grounds.

On March 2, 1896, the court adjudged the value of the lots or parts of lots in squares 63, 89, 129, and 148 included within the limits of the improvement the claims to which were allowed, and the sum of $26,684.09 was appropriated in the District of Columbia appropriation act of June 11, 1896, to be paid to the several claimants by the court.

The case, however, was taken, on appeal, to the Supreme Court of the United States. No decision has as yet been made.

The amount expended upon the improvement to include June 30, 1896, was $2,131,049.79. It resulted in the dredging of a channel 20 feet deep and 550 feet wide through the bar above Long Bridge, and in restoring the standard 20-foot navigation by dredging shoals formed by various freshets; in widening the natural channel just below Long Bridge from 50 to 500 feet and deepening it to 20 feet; in dredging a channel 350 feet wide and 20 feet deep through the bar in the Virginia Channel near Giesboro Point; in dredging in the Washington Channel a channel for navigation 20 feet deep and 400 feet wide from Long Bridge to Giesboro Point; in dredging between the navigation channel and Section III to the depth of 12 feet; in dredging the junction of the Washington and Virginia channels to depths of from 12 to 20 feet; in dredging the tidal reservoir (111 acres) to a depth of about 8 feet; in the construction of the reservoir outlet 38,885 linear feet of sea wall, 5,965 feet of training dike, and in the reclamation of 621 acres of land to heights of from 7 to 12 feet above low tide.

For convenience of designation and reference the reclaimed area has been divided into three sections, as follows:

Section I comprises the reclaimed area between Easbys Point and the sewer canal at the foot of Seventeenth street NW. Section II comprises the reclaimed area and the tidal reservoirs lying between the sewer canal and the Long Bridge. Section III comprises all of the reclaimed area below the Long Bridge lying between the Washington and Virginia channels.

AREAS.

Following is a summary of the areas of the several portions of the reclaimed area of the Potomac River improvement:

	Acres.
Total area (including reservoirs):	
Section I	134.81
Section II	277.08
Section III	327.53
Total area	739.42
Area of reservoirs:	
Large tidal reservoir	111.17
Small tidal reservoir	7.13
Total of reservoirs	118.30
Total area, as above	739.42
Deduct area of reservoirs	118.30
Total area of land	621.12

WORK OF THE FISCAL YEAR ENDED JUNE 30, 1897.

Dredging.—A survey of the bar above the Long Bridge was made in July, 1896, which showed that shoaling had taken place from freshets since the last dredging operations (those of 1895), reducing the ruling depth to about 17½ feet.

The approved project for the expenditure of the appropriation of June 3, 1896, provided for dredging above Long Bridge to a depth of 20 feet at low tide, the dredged material to be deposited on sections I and II, and for widening the natural channel below the bridge, the depth of the widened part of the channel also to be 20 feet at low tide. The facts that the working season of 1896 would be very far advanced before a contract could be made and dredges placed on the work, and that freshets and consequent shoaling might be expected in the winter and early spring, conspired to render it advisable to defer the dredging operations until the working season of 1897. Under date of January 18, 1897, public advertisement was issued inviting proposals for dredging at the above-mentioned localities. Bids were opened February 17, 1897. An abstract of those received is appended to this report. The lowest bidder was A. M. Clegg, of Washington, D. C., to whom the contract was awarded. The contract was made March 9, 1897. It provides for the commencement of the work on July 1, 1897, and its completion on October 1, 1898, 40,000 cubic yards to be dredged per month and deposited on the flats.

Sea wall.—On June 30, 1896, the construction of the sea wall was in progress both on the Virginia Channel front of Section I and in the tidal reservoir. The wall construction on the Virginia Channel front of Section I was continued until September, 1896, when the work in progress at this locality was finished, 527 linear feet of wall having

been built since June 30, 1896. The work in the tidal reservoir consisted chiefly in laying the upper section of the wall in cement mortar, the lower section, from low tide to 2½ feet above low tide, having been laid during the previous winter. Operations were continued at this locality until September, 1896, when the wall in the tidal reservoir was completed, except along the shore occupied as a bathing beach and the portion adjacent to the site of the inlet gates.

The part of the old sea wall along the lower end of the Washington Channel front of Section III, and which had been laid without mortar, had settled considerably, owing to the soft bed of the river upon which the old riprap foundation had been placed. The lower part of the Washington Channel is navigated by ferryboats and steamers. The swells caused by these craft dashed over the wall at high tide, dislodging at times more or less loose stone. Small stones of the dry wall were also dislodged from other causes, as reported. It therefore became necessary to raise this part of the sea wall, and in order to obviate the difficulties above mentioned it was decided in August, 1896, to relay the wall, the part of the wall above a line 2 feet above low tide to be laid in cement mortar. The top of the wall to be, if so required, at an elevation of 8 feet above low tide. The work of taking down and relaying in sections commenced September 21, 1896, and continued until November 25, 1896, when operations were suspended for the season. Active operations on the wall were resumed May 24, 1897, and at the close of the fiscal year were still in progress. The work was done by hired labor; 2,130 linear feet of this relaying have been carried to an elevation of 6 feet above mean low tide, and 2,870 linear feet remain to be relaid.

The amount expended during the past fiscal year was $31,444.05.

The total of sea wall built to date is 35,289 linear feet, of which 2,730 linear feet have been relaid.

The total number of cubic yards of material dredged from the channels, from the commencement of the improvement (1882) to date, is 10,681,000 cubic yards, and is as follows:

For the fiscal year ended June 30—	Cubic yards.	For the fiscal year ended June 30—	Cubic yards.
1883	200,000	1891	282,500
1884	1,115,000	1892	727,700
1885	1,085,000	1893	156,500
1886	1,832,600	1894	691,100
1887	1,081,500	1895	524,700
1888	1,192,100	1896	None.
1889	1,088,300		
1890	704,000	Total	10,681,000

BENEFITS TO COMMERCE AND NAVIGATION.

The benefits to commerce and navigation have been most marked. Vessels of the draft now engaged in the coal trade from Georgetown were formerly unable to cross the bar in the Virginia Channel. The increased draft now practicable has decreased freight rates materially. In the Washington Channel the increased depth has enabled deeper draft vessels engaged in the ice trade to reach the port and freights have decreased, while increased width has greatly facilitated the management of steamers navigating the river. All of the coal shipped and most of the asphalt received pass through the Virginia Channel. The greater part of the ice received and all freights received by steamers

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An appropriation of $12,000 was made August 17, 1894, but the channel already dredged answers all present needs, and it has been decided to hold the new appropriation until its expenditure is required.

Money statement.

July 1, 1896, balance unexpended	$12,000.00
July 1, 1897, balance unexpended	12,000.00
Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	45,000.00

The following are the amounts and dates of appropriations for improving channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland:

July 13, 1892	$28,000
August 17, 1894	12,000
Total	40,000

I 3.

IMPROVEMENT OF HARBOR OF SOUTHWEST BALTIMORE (SPRING GARDEN), MARYLAND.

The river and harbor act of June 3, 1896, contained the following item:

Improving harbor of Southwest Baltimore (Spring Garden), Maryland, in accordance with report submitted March seventh, eighteen hundred and ninety-six, for constructing channel one hundred feet wide on the bottom, five thousand dollars.

The report referred to in the act is to be found printed in House Doc. No. 304, Fifty-fourth Congress, first session, and on pages 1006–1007, Annual Report of the Chief of Engineers for the fiscal year ending June 30, 1896.

The total estimated cost of the improvement was $314,000.

There were no operations in the year ending June 30, 1897.

Money statement.

Amount appropriated by act of June 3, 1896	$5,000.00
July 1, 1897, balance unexpended	5,000.00
Amount (estimated) required for completion of existing project	309,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following is the amount and date of appropriation for improving harbor of Southwest Baltimore (Spring Garden), Md:

June 3, 1896	$5,000

I 4.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Schooner Margaret Kennedy.—This vessel, loaded with lime, grounded and wrecked off Fort McHenry, in Baltimore Harbor, Maryland, in the summer of 1895, and was a dangerous obstruction to the navigation of the small craft of the Chesapeake Bay and tributaries, beating in and

out of the harbor. After circular letter and poster advertisement, the wreck was entirely removed by exploding dynamite under it and carrying the pieces ashore. The removal was completed February 24, 1897, at a cost of $125, with funds allotted from the appropriation for removing sunken vessels or craft obstructing or endangering navigation.

I 5.

SURVEY OF BALTIMORE HARBOR, MARYLAND, WITH A VIEW TO SECURING A CHANNEL 30 FEET IN DEPTH.

[Printed in House Doc. No. 50, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of October 17, 1896, by Col. Peter C. Hains, Corps of Engineers, prepared under the requirements of the river and harbor act of June 3, 1896, which provides for survey of Baltimore Harbor, Maryland, with a view to securing a channel 30 feet in depth.

Colonel Hains estimates that to deepen the channel to 30 feet at mean low water, with a bottom width of 600 feet and side slopes of 3 base to 1 vertical, will cost $2,500,000. To maintain the channel after completion will require an annual expenditure of $50,000.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., October 17, 1896.

GENERAL: In compliance with the directions contained in your letter dated September 5, 1896, I have the honor to submit the following report on the survey of "Baltimore Harbor, Maryland, with a view to securing a channel thirty feet in depth," provided for by the river and harbor act of June 3, 1896.

The same law contained the following item:

> Improving deep channel in Baltimore Harbor, Maryland, in accordance with the project submitted December first, eighteen hundred and ninety-four, four hundred thousand dollars: *Provided*, That this sum may be used in the discretion of the Secretary of War, under the direction of the Chief of Engineers, for deepening the present channel to a depth of thirty feet.

A survey of the channel and the river and bay adjacent was made after finishing the 27-foot project, and the maps of it were completed in May, 1895. These maps furnish sufficient data to prepare a project under the law quoted above to deepen the channel to 30 feet at mean low water, with a bottom width of 600 feet and side slopes of 3 base to 1 vertical. Such a project was submitted, and was approved by the honorable Secretary of War The estimated cost of the project is

$2,500,000, and provides for an annual expenditure of $50,000 to maintain it after completion. Specifications have been prepared, and proposals invited for the expenditure of the appropriation made by the law, in deepening the channel to 30 feet for such width as the available funds will permit, and no further survey is necessary at this time.

Very respectfully, your obedient servant,

PETER C. HAINS,
Colonel, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

I 6.

SURVEY OF ANNAPOLIS HARBOR, MARYLAND.

[Printed in House Doc. No. 57, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 4, 1896.

SIR: The river and harbor act of June 3, 1896, provides for a survey of Annapolis Harbor, Maryland, as follows:

Annapolis Harbor, with a view to straightening, widening, and deepening the channel of the entrance to said harbor, so as to obtain a ship's channel of one hundred and fifty feet wide and twenty-eight feet deep at mean low water, from Chesapeake Bay to the wharves of the United States Naval Academy in said harbor.

The duty of making this survey was assigned to Col. Peter C. Hains, Corps of Engineers, and I have now the honor to submit the accompanying report upon the subject by that officer, dated November 28, 1896.

Colonel Hains states that there can be no question that the only practical way to improve the navigation in the manner required by the act is to dredge a channel from the deep water of the bay to the inner harbor, and estimates that to dredge a channel 3½ miles long, with side slopes 1 on 3 and 28 feet deep at mean low water, will cost $142,000.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF COL. PETER C. HAINS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., November 28, 1896.

GENERAL: The river and harbor bill of June 3, 1896, contains the following:

Annapolis Harbor, with a view to straightening, widening, and deepening the channel of the entrance to said harbor so as to obtain a ship's channel of one hundred and fifty feet wide and twenty-eight feet deep at mean low water, from Chesapeake Bay to the wharves of the United States Naval Academy in said harbor.

J 2.

IMPROVEMENT OF OCCOQUAN CREEK, VIRGINIA.

Occoquan Creek is a tributary of the Potomac River, which it enters about 25 miles below Washington, D. C. The stream is navigable from its mouth at Sandy Point to the town of Occoquan, a distance of 4 miles. Navigation was obstructed by four bars, which were improved between 1873 and 1880 by dredging and dike construction so as to secure a navigable depth of about 6 feet at low tide. Four appropriations were made from 1873 to 1878, amounting to $25,000, and in 1880 the improvement was regarded as completed.

In compliance with the provisions of the river and harbor act of August 11, 1888, a new survey of the creek was made in 1889. The condition of the several bars at that date was as follows:

Lower Mud (about 3.5 miles below Occoquan).—This bar had a least depth of about 3 feet and a length of about 4,000 feet. The former dredged channel was found to have filled in.

Upper Mud (about 2¼ miles below Occoquan).—This bar is about 2,000 feet long. The channel dredged in 1874–75 was found to have maintained its original dimensions, the width being about 50 feet and the depth from 5 to 6 feet.

Sand Bar (about half a mile below Occoquan).—The channel formerly dredged here had filled in, the least depth being 4.2 feet.

Occoquan Bar (a sand bar opposite Occoquan).—This is a short bar with a least depth of 4 feet, the dredged channel having filled in.

PLAN OF IMPROVEMENT AND PRESENT PROJECT.

The depth desired for navigation was 6 feet at low tide. It was proposed in the report upon the survey to secure this depth by dredging channels 8 feet deep and from 100 to 150 feet wide, and by the construction of dikes, at an estimated cost of $91,250. (Report of the Chief of Engineers, Part II, pp. 1089–1096.) On September 19, 1890, an appropriation of $10,000 was made for the new improvement, for which the following project was approved December 5, 1890:

Lower Mud.—A channel 6 feet deep to be dredged, the "upper section" for about 2,500 feet below Taylors Point to be 100 feet wide, the material to be deposited on the west side of the channel, and the remainder of channel, or "lower section," to be 150 feet wide.

Upper Mud.—A channel 100 feet wide and 6 feet deep to be dredged, the material to be deposited on the east side of the channel, and the embankment so formed connected with the left bank by a dike.

Sand Bar.—A channel 100 feet wide and 6 feet deep to be dredged, and sheet-pile dikes constructed to maintain the dredged channel.

Occoquan Bar.—A channel 100 feet wide and 6 feet deep to be dredged, and a dike to be constructed to maintain the depth.

The estimated cost of this, which is the present approved project, is $45,000.

WORK DONE AND RESULTS OBTAINED.

The work on this improvement, up to June 30, 1896, resulted in dredging channels from 100 to 150 feet in width, and from 6 to 8 feet in depth through the four bars named. Some shoaling has since occurred, particularly at the Lower Mud, making redredging necessary to the completion of the project. One thousand five hundred and eighty-five

linear feet of dike have also been built and as follows: At Occoquan Bar 783 and at Sand Bar 802 feet.

This work has resulted in securing a 6-foot navigation through all the bars to the town of Occoquan. Amount expended to include June 30, 1896, $19,896.94.

WORK DONE DURING THE FISCAL YEAR ENDED JUNE 30, 1897.

No work of improvement was done during the year. In March, 1897, an examination of the stream was made. It was found from the examination that the channel through Occoquan Bar and Sand Bar had the required dimensions of 6 feet in depth at low tide and 100 feet in width, the dikes having apparently had the effect of preserving the same. The channel through the Upper Mud was found as a general rule to have a width of 100 feet and a depth of 6 feet. The channel through the Lower Mud had shoaled considerably on the sides, although 6 feet could still be carried through the center. This channel requires redredging.

On the 21st of June, 1897, advertisement was issued inviting proposals for dredging in the channel at the Lower Mud. The work is to be done under the appropriation of $2,500 made by act of Congress of June 3, 1896. It is proposed to commence this dredging as soon as a contract for it shall be made. The work to be done at this point and at Aquia Creek, Nomini Creek, and Lower Machodoc Creek, Virginia, will be included in one contract. The sum of $138.06 was expended during the fiscal year ended June 30, 1897, for examination of the channel and office expenses.

PRESENT CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

Channels 6 feet deep and 100 feet wide are now available through three bars, and dikes have been built at two of these bars. The channel through the Lower Mud has a ruling depth of 6 feet, but the width between the 6-foot contours has been diminished by shoaling.

The work remaining to complete the project is the extension of the dike at Sand Bar, the construction of the dike at Upper Mud, and such dredging as may be needed to restore the channel dimensions called for by the project. In this connection it may be said that the project, like most projects for dredging, is not regarded as capable of permanent completion. That is, the channels may all be dredged according to the original project and protected by jetties and yet occasional retouching, by dredges, of the dredged areas, or of the channels above and below them, may be necessary.

The sum of $6,000 can be profitably expended during the fiscal year ending June 30, 1899, in extension and construction of dikes as mentioned, and in dredging. It is believed that the present project can be completed for less than the original estimate of cost.

BENEFIT TO COMMERCE AND NAVIGATION.

The work done under the appropriations for this improvement has been of material benefit to the trade and commerce of Occoquan by increasing the original ruling depth of 3 feet at low tide, which could be carried to the town, to 6 feet, thus obviating the delays due to waiting for tides, and increasing the available draft of vessels trading in

the creek. In this connection, attention is invited to the table herewith giving statistics in detail.

The cost of the present project was estimated as $45,000, toward completion of which the sum of $22,500 in all has been appropriated since September 19, 1890.

Occoquan Creek is in the collection district of Alexandria, which is also the nearest port of entry. The nearest light-house is at Fort Washington, Md.

Money statement.

July 1, 1896, balance unexpended	$2,603.06
June 30, 1897, amount expended during fiscal year	138.06
July 1, 1897, balance unexpended	2,465.00
Amount (estimated) required for completion of existing project	22,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	6,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made for the new project:

September 19, 1890	$10,000
July 13, 1892	5,000
August 17, 1894	5,000
June 3, 1896	2,500
Total	22,500

COMMERCIAL STATISTICS.

[Furnished by Messrs. L. Ledman and Tyson Janney, Occoquan, Va.]

Receipts and shipments by water.

Articles.	1891.	1892.	1894.	1895.	1896.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Coal	100	100	100	100	100
Fertilizers	.....	.....	.....	200	.....
Flour and grain	60	550	900	1,400	1,200
Lumber	600	800	320	200	300
Piles	.....	.....	1,000	100	2,150
Railroad ties	3,600	3,000	3,600	2,500	7,000
Sand	.....	48,000	.....	5,000	23,400
Wood	3,500	3,600	2,400	750	7,120
Miscellaneous	345	655	580	225	400
Total	8,205	56,705	8,900	10,475	41,670

Arrivals and departures of vessels, 1896.

Steam vessels drawing less than 10 feet	614
Sail vessels drawing less than 10 feet	96
Barges, flatboats, etc	808
Total	1,518

No new lines of transportation were established in 1896. It is reported that the work done has lessened the cost of shipping, since vessels can now load more heavily at the wharves, whereas formerly part of the cargo had to be taken out to them in lighter-draft boats.

J 3.

IMPROVEMENT OF AQUIA CREEK, VIRGINIA.

Aquia Creek is a tributary of the Potomac River, which it enters 41 miles below Washington, D. C. The stream is navigable to Wharton Landing, about 7.25 miles above the mouth. The upper part of the creek has a well-defined channel, with a width of from 60 to 200 feet, while the depth was originally from 2 to 17 feet. At a point called the "Narrows," about 4.5 miles above the mouth, the stream suddenly expands into a bay from 1,000 to 6,000 feet wide, forming a continuous shoal on which the depth ranged generally from 2 to 4 feet, increasing near the mouth to about 7 feet. About 3 miles above the mouth the creek is crossed by a trestle bridge of the Richmond, Fredericksburg and Potomac Railroad. The bridge is provided with a draw 28 feet wide.

Between 1872 and 1878 $10,000 was appropriated by Congress and expended in dredging a channel through shoal portions of the creek between Davis Point (about one-third of a mile below the railroad bridge) and Wharton Landing, the channel being from 40 to 50 feet wide and from 4 to 5 feet deep at low tide.

A new survey of the creek was authorized by the river and harbor act of August 11, 1888, and made in 1889. The channel formerly dredged was found to be about 40 feet wide and from 4 to 5 feet deep between the railroad bridge and the Narrows. Below the railroad bridge and in the upper part of the creek near Wharton Landing it had filled in. Dent Landing, about three-quarters of a mile below Wharton Landing, was regarded as the highest point to which navigation could be maintained except at great expense. The obstructions to navigation below Dent Landing were the long shoal of soft mud between the mouth and the Narrows, on which the depth ranged from 2 to 4 feet; a short bar at the mouth of Austen Creek, with a ruling depth of 4 feet, and a wreck at Coal Landing.

PLAN OF IMPROVEMENT.

In the report on the survey (Report of the Chief of Engineers, 1890, pp. 1096–1103) it was proposed to dredge a channel 150 feet wide and 8 feet deep between the mouth and the Narrows, and a channel 80 feet wide and 8 feet deep through the bar at the mouth of Austen Creek. The estimated cost of the improvement was $101,278.

On September 19, 1890, Congress appropriated $10,000 for this work. Upon further examination of this creek in 1890 the character of its navigation and the amount of its trade did not seem to warrant so large an expenditure as was proposed in the report on the survey of 1889. Six-foot navigation was regarded as sufficient to give all the relief needed at the present time, leaving the subject of greater depth for future action, if trade were developed by this improvement.

THE PRESENT APPROVED PROJECT.

The following project for the work was therefore adopted December 4, 1890: A channel 80 feet wide and 6 feet deep to be dredged between the mouth and the Narrows, at an estimated cost of $40,000; the material dredged below the railroad bridge to be removed in scows, and that above the bridge for the most part to be deposited on the sides of the channel. The proposed work above the Narrows was omitted. The estimated cost has since been reduced to $21,000.

WORK DONE AND RESULTS OBTAINED.

The work on this improvement up to June 30, 1896, resulted in securing a channel 6 feet deep and 80 feet wide through the greater part of the shoal between the mouth and a point one-fourth of a mile below the Narrows, a total distance of 4¼ miles. Amount expended to June 30, 1896, $17,227.24.

Congress by act of June 3, 1896, appropriated the sum of $3,000 for the improvement.

WORK DONE DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

The operations consisted in an examination of the channels made in March, 1897, which showed that below the railroad bridge on the left side of the channel line there was a slight shoal, the depth being a few tenths less than the standard of 6 feet. Above the railroad bridge the dredged channel, 6 feet deep, was generally in good condition, while the uncompleted portion of the work near the Narrows was unchanged.

Under date of June 21, 1897, proposals were invited by public advertisement for the dredging required above and below the railroad bridge to complete the project. It is proposed to do that dredging this season under the appropriation of June 3, 1896, and a balance of about $500 remaining from the appropriation of August 17, 1894, the work at this point and at Occoquan, Nomini, and Lower Machodoc creeks, Virginia, to be included in one contract.

Amount expended during the fiscal year, $184.86.

BENEFIT TO COMMERCE AND NAVIGATION.

The work already done has been of benefit to the existing trade of the creek by enabling vessels trading here to come up to within a short distance of the Narrows at low tide, and also in enabling vessels to pass each other readily in the dredged channel. The trade is chiefly in tobacco and railroad ties. In connection with this, please see table of statistics herewith.

PRESENT CONDITION OF THE IMPROVEMENT AND WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

The dredged channel, as said, has been practically completed for about 4½ miles from the mouth, or within about one-quarter of a mile of the Narrows, the upper limit of the improvement. The work remaining to be done under the project is the completion of the dredged channel above the railroad bridge and the removal of any shoal places which may be found in the channel heretofore dredged. For this work the appropriation of June 3, 1896, of $3,000 will be sufficient, and no further appropriation will be needed for some time to come, if at all.

Aquia Creek is in the collection district of Alexandria, which is the nearest port of entry. The nearest light-house is at Maryland Point, Maryland.

Money statement.

July 1, 1896, balance unexpended	$3,772.76
June 30, 1897, amount expended during fiscal year	184.86
July 1, 1897, balance unexpended	3,587.90

APPROPRIATIONS.

The following appropriations have been made for the new work:

September 19, 1890	$10,000
July 13, 1892	5,000
August 17, 1894	3,000
June 3, 1896	3,000
Total	21,000

COMMERCIAL STATISTICS.

[Furnished by Mr. R. L. Flatford, Stafford, Va.]

Receipts and shipments by water, calendar year 1895.

	Tons.
Farm produce	150
Lumber	200
General merchandise	200
Railroad ties	10,000
Tobacco	8,000
Total	18,450

Arrival and departure of vessels.

Class.	Number.	Tonnage.
Steamers drawing less than 10 feet	240	24,000
Sail vessels drawing less than 10 feet	320	40,000
Barges, flatboats, etc	80	24,000

Repeated efforts were made to obtain commercial statistics for 1896, but they could not be procured.

J 4.

IMPROVEMENT OF NOMINI CREEK, VIRGINIA.

Nomini Creek enters the Potomac River about 82 miles below Washington, D. C. At the date of the survey, preliminary to the inception of the improvement (1872), its navigation was obstructed by a bar of oyster shells and sand at its mouth, over which but 3 feet could be carried at low tide. The dangers and difficulties in passing the bar were still further increased by strong cross tidal currents just inside the mouth at White Point. After passing the bar a wide and navigable stream is found, in which about 8 feet can be carried for about 3½ miles, or nearly to Nomini Ferry, while 5 feet can be carried for about 6 miles above the mouth.

PLAN OF IMPROVEMENT AND PRESENT PROJECT.

The original project, adopted in 1873, provided for dredging a channel through the bar 100 feet wide and 9 feet deep at low tide, with side slopes of 2 to 1, at an estimated cost of $20,000. The project was

amended in 1879 by increasing the width to 150 feet, in order to meet the demands of increased trade. In 1882 and 1885 the project was again modified so as to provide for a channel 200 feet wide and 9 feet deep, and also for dredging a tributary channel and the construction of training dikes. The total cost of this amended project was placed at $62,500. In 1888 this estimate was increased to $72,500, the channel having deteriorated during the suspension of work from 1883 to 1889. Owing to the position of the channel, exposed to north and northwest winds and to cross tidal currents, it was difficult to secure any permanent or satisfactory results. The deterioration of the channel outside White Point is believed to be largely due to material stirred up by northwest winds and carried into the channel by the ebb and flood currents of Currioman Bay. In order to maintain the channel and prevent this injurious action, the project was modified in 1890 as follows: (1) The dredged channel to be 9 feet deep and 150 feet wide, this width being sufficient for navigation and more likely to hold its depth; (2) two jetties to be constructed, one from White Point on the east and one from Cedar Island on the west of the dredged channel, to extend out into Nomini Bay parallel to the channel; (3) dikes to be built inside White Point to check the cross currents, but the tributary channel to be omitted. The estimated cost of the project as thus modified was $72,500. The estimate, as revised in 1897, was increased to $105,000, the details of which are given in this report under the head of "Present condition of the improvement," etc.

WORK DONE AND RESULTS OBTAINED.

The total expended on this improvement to June 30, 1896, inclusive, was $56,437.79. It resulted in securing a channel 150 feet wide and 9 feet deep at low tide through all parts of the bar excepting at the mouth, where the dredged channel has shoaled somewhat. Eight hundred and nineteen linear feet of the east jetty has also been constructed.

The sum of $1,073.57 was expended during the fiscal year ended June 30, 1897, which sum included the Treasury settlement of a claim of Thomas P. Morgan amounting to $644.22 under his contract for dredging, dated October 12, 1894.

An examination of the dredged channel was made in April, 1897. The channel outside White Point was found somewhat shoal, the ruling depth being 8.4 feet at low tide. Inside White Point for a distance of about 1,000 feet there has also been slight shoaling. The remainder of the channel was in good condition and had the full width and depth called for by the project. The east jetty was found for the most part in good condition. The sand has filled in and been banked up on the east side of the jetty, showing that the jetty is arresting the littoral drift which caused the shoaling in the outer channel. On June 21 advertisement was issued inviting proposals for dredging in the channel near White Point, proposals to be opened July 21, 1897.

BENEFIT TO COMMERCE AND NAVIGATION.

This improvement has benefited the existing navigation and commerce by facilitating shipments of grain, truck, oysters, etc., by three lines of steamers to the markets of Washington and Baltimore. In this connection please see statistics herewith.

PRESENT CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

The channel inside White Point is practically completed to the depth of 9 feet and width of 150 feet, excepting that there has been some slight shoaling for a length of about 1,000 feet. Outside the Point the channel has shoaled somewhat from the littoral movement of sand. The least depth in the outer channel is now about 8 feet at low water.

The work remaining to be done under the project is completion of the east jetty, construction of the west jetty, and such dredging as may be necessary to restore the channel to the dimensions called for in the project. The east jetty has been partly built, but should be extended about 400 feet and raised. The existing section was built with the top 2 feet above low tide, which was thought to be a sufficient height. It is found in practice, however, that the sand drifts over the top of the jetty during easterly storms which are accompanied by high tides. In order to prevent this it is proposed to raise the existing jetty 2 feet to a height of 4 feet above low tide and build the remainder of the east jetty and the west jetty to the same height. The width on top is 6 feet and the side slopes are $1\frac{1}{2}$ to 1. The jetties are built of a hearting of oyster shells, covered with heavy stone, placed carefully on the side slopes and top. Experience shows that at this locality, which is somewhat exposed, the work is difficult and expensive and attended with some loss of material. It has therefore been necessary to revise the estimate of the cost of completing the work. It is estimated that the cost of completing the project, after the expenditure of the appropriation of June 3, 1896, will be $45,000. This, added to the $60,000 appropriated to date, makes the total cost of the revised estimate $105,000.

The sum of $12,000 can be profitably expended during the fiscal year ending June 30, 1899, in raising and extending the east jetty and in probable dredging.

With the appropriation of June 3, 1896, it is proposed to, during the present year, redredge the channel near the mouth, where shoaling has occurred.

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is that at Blakistone Island.

Money statement.

July 1, 1896, balance unexpended	$3,562.21
June 30, 1897, amount expended during fiscal year	1,073.57
July 1, 1897, balance unexpended	2,488.64
Amount (estimated) required for completion of existing project	45,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	12,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made:

May 3, 1873	$10,000	August 11, 1888	$5,000
June 23, 1874	6,000	September 19, 1890	5,000
March 3, 1875	5,000	July 13, 1892	10,000
March 5, 1879	2,500	August 17, 1894	5,000
June 14, 1880	5,000	June 3, 1896	2,500
March 3, 1881	2,000		
August 2, 1882	2,000	Total	60,000

COMMERCIAL STATISTICS.

[Furnished by Mr. F. E. Tubman, Mount Holly, Va.]

Receipts and shipments by water.

Articles.	1892.	1893.	1894.	1895.	1896.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Coal	10	8	10	8	10
Farm produce	100	150	100	150	125
Grain	400	500	4,500	4,000	3,500
Lumber	500	400	6,000	5,000	400
Oysters	5,000	4,000	3,500	3,000	500
Railroad ties	5,000	4,500	3,000	3,000	2,000
General merchandise	10,000	.....	.....	90	90
Wood	.....	8,000	8,000	1,000	800

Tonnage by years.

Year.	Tons.	Year.	Tons.
1889	13,542	1893	17,658
1890	15,825	1894	25,100
1891	62,300	1895	16,250
1892	a21,000	1896	7,425

a This calculation is for sailing vessels only. The steamers carry the great bulk of grain and merchandise.

No new lines of transportation were established in 1896. It is reported that the work done has materially lowered freight rates. There has been a general stagnation in business during the year, very little produce paying to handle it.

J 5.

IMPROVEMENT OF LOWER MACHODOC CREEK, VIRGINIA.

Lower Machodoc Creek is a tidal estuary of the Potomac River, which it enters on the right, about 85 miles below Washington, D. C. It is the next stream below Nomini Creek, and its mouth is just above Coles Point. The creek lies within Westmoreland County, Va., and has a navigable length of about 4 miles. The width between banks at the mouth is 1 mile, and between the 12-foot contours the channel width exceeds 3,000 feet. The lower part of the creek for a distance of 1½ miles above the mouth is from three-fourths of a mile to 1 mile in width, with a navigable depth of 13 feet, affording a safe harbor during northeast to southeast storms.

At the "Narrows," 2 miles above the mouth, the stream suddenly contracts to a width of 650 feet, and the channel is obstructed by a sand bar, over which but 4 feet can be carried at low tide. This bar constitutes the principal obstruction to navigation.

On the right there is a projecting spit of sand about 2,000 feet in length, called "Narrows Beach," which makes out from the right bank, extending nearly across the creek and along the entire length of the bar and obstructing and deflecting the natural flow of the tidal currents. A shoal also extends out from Plumb Point on the left bank of the creek, just below. The bar proper, lying between these projecting points, had a ruling depth of 4.3 feet, the best water being

on the extreme right near Narrows Beach. This was the channel formerly used by vessels, and it was quite tortuous and difficult to navigate. In the center of the stream the bar is quite shoal, having a depth of but little more than 1 foot, while on the left the ebb tide has cut a channel nearly 6 feet deep well below Plumb Point. Borings taken at the bar show it to be composed chiefly of sand, with some admixture of mud, clay, and shells.

After passing Narrows Bar a depth of from 10 to 14 feet is found in the channel, gradually shoaling to about 9 feet near Cupelo Point, 3 miles above the mouth, and thence to about 6 feet at Drum Bay, the head of navigation, 4 miles above the mouth. Above the Narrows the bottom is quite soft, and the stream could be navigated by vessels drawing a foot more than the depths above mentioned.

PRESENT APPROVED PROJECT FOR IMPROVEMENT.

The project for the improvement, adopted November 29, 1892, provides for dredging a channel 150 feet wide and 9 feet deep at low tide through the bar at the Narrows, at an estimated cost of $15,000.

WORK DONE AND RESULTS OBTAINED.

The sum of $7,500 was appropriated for this improvement from July 13, 1892, to June 3, 1896, inclusive. Of this, $5,706.33 were expended by June 30, 1896. This expenditure resulted in dredging a channel at the Narrows 150 feet wide, with depths at the sides of 6 feet and a depth of 9 feet for a width of 70 feet in mid-channel. Length of the 9-foot channel dredged, 1,380 feet.

WORK DONE DURING THE FISCAL YEAR ENDED JUNE 30, 1897.

An examination of the channel made in April, 1897, showed that a small amount of shoaling had occurred since the dredging of April, 1896. Under date of June 21, 1897, advertisement was issued inviting proposals for the work of dredging to be done under the appropriation of $1,500 made by the act of June 3, 1896. Dredging for this work and for Nomini, Occoquan, and Aquia creeks, Virginia, to be done under one contract.

BENEFIT TO COMMERCE AND NAVIGATION.

The steamer *Harry Randall* of Randall's Potomac River Line now, it is reported, makes weekly trips from Washington, D. C., through the channel to new wharves which have been established above Narrows Bar, thus giving this section an outlet to market.

Repeated efforts have been made to obtain commercial statistics for this work, and without successs. There does not appear to be any one on the ground who has the necessary information or who can obtain it. Consequently, there is no adequate measure of the value of the improvement.

PRESENT CONDITION OF THE IMPROVEMENT AND WORK REQUIRED TO COMPLETE APPROVED PROJECT.

The dredged channel, now 150 feet wide, with least depth of 6 feet, needs dredging to a depth of 9 feet over the entire width of 150 feet in order to complete the project.

For full description and account of this work, please see Appendix I to the Annual Report of the Chief of Engineers for 1896.

It is proposed to carry on, this season, the work of dredging, to be done under the appropriation of June 3, 1896.

The sum of $3,000 can be profitably expended during the fiscal year ending June 30, 1899, in dredging.

The project for this work is not regarded as capable of permanent completion, as more or less dredging will be required from time to time to maintain the channel.

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is at Blackistone Island.

Money statement.

July 1, 1896, balance unexpended	$1,793.67
June 30, 1897, amount expended during fiscal year	228.07
July 1, 1897, balance unexpended	1,565.60
Amount (estimated) required for completion of existing project	7,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897	

APPROPRIATIONS.

The following appropriations have been made:

July 13, 1892	$3,000
August 17, 1894	3,000
June 3, 1896	1,500
Total	7,500

COMMERCIAL STATISTICS.

Repeated efforts have been made to obtain commercial statistics for this work, but it has been impossible to procure them.

J 6.

IMPROVEMENT OF RAPPAHANNOCK RIVER, VIRGINIA.

The Rappahannock River is navigable from its mouth, in Chesapeake Bay, to Fredericksburg, Va., a distance of 106 miles. The lower part of the river has the character of a tidal estuary, the width varying from 1 to 3.5 miles. The ruling depth at the mouth is 5 fathoms, and this depth holds to Jones Point, 28 miles above, while 17 feet can be carried within 1 mile of Tappahannock, which is 41 miles from the mouth. Above Tappahannock the river has a tortuous course, and above Port Royal, 29 miles from Fredericksburg, it flows between high banks. The width at Fredericksburg is about 350 feet, gradually increasing to about 1,500 feet at Port Royal. In 1871, prior to the inception of the improvement, 6 feet could be carried to within a mile of Fredericksburg, and thence 4 feet to the town.

The Rappahannock River drains a large area of agricultural country and is subject to freshets. The highest known freshet occurred in June, 1889, when the river rose to 32.8 feet above low tide at Fredericksburg. The freshet slope falls below Fredericksburg as the river widens. Freshets are but little felt at Port Royal, and not at all at Tappahannock. They bring down large quantities of sediment and are the chief factors in bar formation. Tides range from 2.5 feet at the mouth to 3.4 feet at Fredericksburg.

The obstructions to navigation lie between Tappahannock and Fredericksburg, 65 miles. The original condition of the bars was as follows:

Naylor Hole (44 miles above the mouth).—A detailed survey of the bar, made in 1885, showed the least depth to be 10.7 feet. The length of the bar between the 15-foot curves was 11,000 feet. Boring showed sand, mud, and gravel.

Nanzatico Reach (72 miles above the mouth and 4 miles below Port Royal).—The ruling depth on the bar is 10.1 feet (survey of 1885), although in the track which can be conveniently followed by steamers the depth is 8.3 feet. The length of the bar between the 15 foot curves is 5,540 feet. The bar is composed for the most part of soft mud.

Farleyvale Bar (94 miles above the mouth and 12 miles below Fredericksburg).—In 1881, before improvement, 9 feet could be carried over this bar, although the depth on the best course was but 8.3 feet. The bar was composed of sand, mud, and gravel, and was about 200 feet long between the 10-foot curves.

Castle Ferry Bar (98 miles above the mouth and 8 miles below Fredericksburg).—The least depth in 1876, before improvement, was 8.4 feet and the length between the 10-foot curves 1,400 feet. The bar is composed of sand and mud.

Spottswood Bar (102 miles above the mouth and 4 miles below Fredericksburg).—In 1871 this bar was 5,400 feet long, with a least depth of 6 feet at the "cross over," where there were three wrecks sunk during the late war. Before improvement this was the most troublesome bar on the river below Fredericksburg Bar, and steamers often grounded here.

Pratt Reach Bar (103 miles above the mouth and 3 miles below Fredericksburg).—The ruling depth before improvement was 8.1 feet and the length between the 10-foot curves about 1,000 feet. This bar is formed of sand and mud.

Bernard Bar (104 miles above the mouth and 2 miles below Fredericksburg).—The ruling depth before improvement was 8.1 feet and the length between the 10-foot curves about 400 feet. The material is sand and gravel.

Pollock Bar (105 miles above the mouth of the river and 1 mile below Fredericksburg).—The bar was about 700 feet long in 1882, before its improvement was commenced, and the ruling depth 7 feet. At the head of the bar and near the right bank there was a ledge of rock on which the depth was from 6 to 7 feet.

Fredericksburg Bar.—This bar commences 1 mile below the railroad bridge at Fredericksburg and extends up to and along the entire wharf front of the town to the bridge. The ruling depth in 1871 was 4 feet. The bar was formed and is constantly renewed by deposits of sand brought down by the recurring freshets. In 1871 six wrecks obstructed the channel over this bar.

The navigation of the Rappahannock is sometimes obstructed by trees and snags carried into the river by freshets.

PLAN OF IMPROVEMENT AND PRESENT APPROVED PROJECT.

The original project, approved in 1871, was to secure a channel 100 feet wide and 10 feet de p by dredging and the construction of dikes from Fredericksburg to Tappahannock, the wrecks obstructing the channel to be removed. The first estimate of the cost of this improvement was $83,760. In 1879 the project was amended so as to provide for dredging a channel 100 feet wide and 10 feet deep through the bars between Fredericksburg and Port Royal, and one 200 feet wide and 15 feet deep between Port Royal and Tappahannock, for a larger class of vessels; the depths secured by dredging to be maintained by a system of wing dams and training dikes, to be built of piles and sheet piling or of piles and brush or logs, the dikes being also required in some cases to secure the dredged material from being carried back into the river.

The total cost of this revised project was estimated as $381,500.

WORK DONE AND RESULTS OBTAINED.

The appropriations for this improvement, from March 3, 1871, to June 3, 1896, both dates inclusive, aggregate $252,500.

The sum expended to the close of the fiscal year ending June 30, 1896, is $241,276.04. This resulted in improving the seven bars between Fredericksburg and Port Royal by dredging and the construction of dikes and the removal of wrecks and snags. The results of the improvement at these bars at the date of the latest examinations are given in the following table:

Locality.	Depth at low water before improvement.	Ruling channel depth at low water at date of latest survey.
	Feet.	*Feet.*
Fredericksburg Bar, below steamboat wharf	4	8.6 (1897)
Pollock Bar	7.3	9 (1894)
Bernard Bar	8.5	10 (1894)
Pratt Bar	8.3	9.2 (1894)
Spottswood Bar	6	8.2 (1894)
Castle Ferry Bar	8	9.5 (1894)
Farleyvale Bar	8	10 (1894)

No work has yet been done at Nanzatico Reach and Naylors Hole.

WORK OF THE FISCAL YEAR ENDING JUNE 30, 1897.

The expenditure of the appropriation of June 3, 1896, was deferred until the working season of 1897. In March, 1897, an examination of Fredericksburg Bar was made, in order to obtain the data needed for the preparation of maps and specifications for the dredging and rock excavation proposed with the fund available. The survey showed a ruling depth of 8.6 feet at this bar.

Amount expended during the fiscal year ended June 30, 1897, $1,271.33, in survey and miscellaneous expenses.

BENEFIT TO COMMERCE AND NAVIGATION.

The work already done has been of material relief to existing navigation, in enabling steamers and vessels which were formerly detained at Spottswood Bar, 4 miles below Fredericksburg, to reach that city

at all stages of the tide. The ruling depth at Spottswood Bar has been increased from 6 to 8.2 feet, while that at Fredericksburg Bar has been increased from 4 to 8 feet. The freight tonnage shows a steady increase, and in 1895 had reached a total of 151,466 tons.

In connection with this, attention is invited to the commercial statistics herewith.

PRESENT CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE PRESENT APPROVED PROJECT.

A draft of 9 feet or more can now be carried over all bars below Fredericksburg Bar, except Spottswood Bar, where the ruling depth is 8.2 feet. At Fredericksburg Bar, the head of navigation and a few miles below the head of tide water, new deposits of sand are formed by each recurring freshet. The experience of about twenty-five years indicates that the improvement of the bars at and near Fredericksburg can not be made permanent, owing to renewed accretions from freshets, and that frequent dredging will be needed for their removal, requiring an annual appropriation for maintenance of $7,500. This estimate of about $7,500 for maintenance has appeared in the Annual Reports for a number of years.

The work remaining to complete the project is the continuation of dredging and dike construction necessary to secure the required dimensions of channel.

The $8,000 appropriated by the act of June 3, 1896, and the unexpended balance of about $1,900 from the appropriation of August 17, 1894, will be expended during the present fiscal year in dredging and removal of some rock at Fredericksburg Bar.

The sum of $15,000 can be profitably expended during the fiscal year ending June 30, 1899, in dredging and dike work.

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is that at Blackistone Island.

Money statement.

July 1, 1896, balance unexpended	$11,223.96
June 30, 1897, amount expended during fiscal year	1,271.33
July 1, 1897, balance unexpended	9,952.63
Amount (estimated) required for completion of existing project	129,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	15,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

The following appropriations have been made:

March 3, 1871	$15,000	July 5, 1884	$20,000
June 10, 1872	15,000	August 5, 1886	20,000
March 3, 1873	15,000	August 11, 1888 ($15,000, of which $3,000 was for Urbana)	12,000
June 23, 1874	7,000	September 19, 1890	15,000
March 3, 1875	5,000	July 13, 1892	20,000
August 14, 1876	10,000	August 17, 1894	10,000
August 18, 1878	13,500	June 3, 1896	8,000
March 3, 1879	10,000		
June 14, 1880	25,000	Total	252,500
March 3, 1881	15,000		
August 2, 1882	17,000		

COMMERCIAL STATISTICS.

Tonnage for—	Tons.	Tonnage for—	Tons.
1888	83,600	1894	*144,070
1890	83,830	1895	*151,466
1892	*126,333	1896	*161,196
1893	*141,750		

Arrivals and departures of vessels, 1896.

Steam vessels:	
Drawing 10 feet or more	504
Drawing less than 10 feet	140
Sailing vessels:	
Drawing 10 feet or more	836
Drawing less than 10 feet	216
Barges, flatboats, etc	384

The principal articles of commerce are grain, oysters, fertilizers, cattle, farm produce, and general merchandise.

No new lines of transportation were established in 1896. It is reported that the work done on this improvement has greatly reduced freight rates, both by rail and water.

J 7.

IMPROVEMENT OF URBANA CREEK, VIRGINIA.

Urbana Creek is a tributary of the Rappahannock River, which it enters 16 miles above the mouth. Navigation was obstructed in 1874 by a bar outside the mouth, over which but 6.5 feet could be carried at low tide. In 1882, after the improvement had been commenced, a shoal within the creek, having a least depth of 7 feet, and near the town of Urbana, was regarded as an obstruction to steamboat navigation.

PLAN OF IMPROVEMENT AND APPROVED PROJECT.

The approved project, adopted in 1879, was the excavation of a channel 150 feet wide and 10 feet deep through the outer bar, at an estimated cost of $20,000. The project was modified in 1883 so as to include dredging a channel through the shoal within the creek, and in 1888 so as to include a system of dikes or jetties along the sand spit at the mouth to prevent the natural channel from closing. The revised estimate for the entire project was $34,580.

Owing to the exposed position of the channel through the outer bar the work suffered deterioration from the action of northwesterly winds, which caused shoaling in the channel and a diminution in its width. In April, 1897, a survey was made to determine the extent of change in the channels. From the map of this survey an estimate was made in June, 1897, of the cost of completing the project by means of dredging and of a jetty to protect the channel dredged through the outer bar. This cost, added to the amounts expended to date, makes the estimated cost of the present approved project $70,000.

WORK DONE AND RESULTS OBTAINED.

The appropriations for this work from March 3, 1879, to June 3, 1896, aggregated $30,500. The amount expended to June 30, 1897, inclusive, was $27,441.80. It resulted in a channel 10 feet deep and from 130 to

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*Furnished by Mr. William D. Scott, Fredericksburg, Va.

150 feet wide through the outer bar, while a channel 10 feet deep and from 80 to 170 feet wide had been dredged at the shoal within the creek, although the recent examinations indicate some deterioration at the last-named locality.

WORK OF THE FISCAL YEAR ENDING JUNE 30, 1897.

The field work consisted in the survey already mentioned.

Amount expended during the fiscal year, $99.10, in survey and miscellaneous expenses.

BENEFIT TO COMMERCE AND NAVIGATION.

The improvement has been of benefit to trade and navigation by permitting the entrance of sailing vessels to the creek and enabling one of the steamers of the Weems Line, Baltimore to Fredericksburg, to enter the creek through the channel and land directly at the town instead of at Urbanna Wharf on the Rappahannock, 1.5 miles from the town.

The accompanying statistics show the value of the commerce depending upon the improvement.

PRESENT CONDITION OF THE IMPROVEMENT AND FURTHER WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

The channel through the outer bar is now from 130 to 150 feet wide and 10 feet deep. Within the creek a comparatively small part of the channel is now 10 feet deep, although 8 feet can be carried to the Urbanna Wharf.

The work required to complete the project is completion of the outer channel to the depth of 10 feet and width of 150 feet, some dredging at the turn at the inner end of this channel, the dredging of the proposed channel within the creek, and the construction of the jetty on the left of the outer channel. Experience shows that the brush and oyster-shell jetties proposed in the modified project of 1885 will not be sufficiently substantial to withstand the action of waves during northwest winds, and the estimate of cost of the necessary jetty work is based upon the use in the jetty of a hearting of oyster shells covered with heavy stone.

With the funds available from the appropriation of $3,000 made by act of Congress of June 3, 1896, it is proposed during the present season to complete the dredging required in the outer channel.

The sum of $20,000 can be profitably expended during the fiscal year ending June 30, 1899, in dredging and in commencing construction of the jetty for maintaining the depth in the outer channel.

For more complete account of this improvement see last annual report.

Urbana is a port of entry in the collection district of Tappahannock. The nearest light-house is that at Bowler Rock.

Money statement.

July 1, 1896, balance unexpended	$3,058.20
June 30, 1897, amount expended during fiscal year	99.10
July 1, 1897, balance unexpended	2,959.10
Amount (estimated) required for completion of existing project	39,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made:

March 3, 1879	$5,000	September 19, 1890	$3,000
June 14, 1880	2,500	July 13, 1892	3,000
March 3, 1881	4,000	August 17, 1894	3,000
August 2, 1882	4,000	June 3, 1896	3,000
August 11, 1888 (included in an appropriation of $15,000 for Rappahannock River)	3,000	Total	30,500

COMMERCIAL STATISTICS.

Calendar year—	Reported by Mr. F. A. Bristow.	Reported by Mr. J. D. Gressitt.
	Tons.	*Tons.*
1891	19,500	22,100
1892	20,095	17,125
1893	55,885	61,290
1894	82,395	88,305
1895	66,530	92,320
1896	137,485	133,925

The principal articles of commerce are oysters, tobacco, railroad ties, coal, grain, and lumber.

Arrivals and departures of vessels, 1896.

Description.	Reported by Mr. F. A. Bristow.	Reported by Mr. J. D. Gressitt.
Steamers drawing 10 feet or more	200	200
Steamers drawing less than 10 feet	400	300
Sail vessels drawing 10 feet or more	20	24
Sail vessels drawing less than 10 feet	1,000	1,200
Barges, flatboats, etc	20	20
Total	1,640	1,744

A daily mail steamer line, running from Carters Creek, or Irvington, to Urbana, was established during 1896. It is reported that the work done on this improvement has greatly reduced freight rates and permitted the use of larger vessels.

J 8.

IMPROVEMENT OF YORK RIVER, VIRGINIA.

The York River is formed by the union of Mattaponi and Pamunkey rivers at West Point, Va., is 41 miles in length, and empties into Chesapeake Bay about 16 miles above Old Point. Entering the river, 24 feet can be carried for 32 miles up to Potopotank Bar, 9 miles below West Point. In 1880 the ruling depth on this bar was 18.5 feet, and its length between the 20-foot curves was 2,200 feet. The next obstruction to navigation is West Point Bar, which commences about 2 miles below West Point and extends up to West Point. Before improvement it had a ruling depth of 15.5 feet. West Point is the shipping point of the Richmond and West Point Terminal Railroad system. The wharves from which shipments are made are built within the mouth of Pamunkey River, and further obstruction to navigation is found in shoal water in front of these wharves.

PLAN OF IMPROVEMENT AND PRESENT PROJECT.

The original project adopted in 1880 proposed the dredging of a channel 22 feet deep and 200 feet wide through the bars at Potopotank and West Point, with an increased width at the wharves at West Point. In 1884, on account of the increased trade, the project was modified by increasing the width of the proposed channel to 400 feet, at a total estimated cost of $256,000. In 1887 the project was again amended to include the construction of a dike along the right bank of the river at West Point Bar, in order to prevent the deposit of silt in the dredged channel.

The estimated cost of the dike, which was to be constructed of piles and sheet piling and to be 8,800 feet in length, was $52,800. The total cost of this revised estimate, which is that of the present project as approved, then became $308,800.

WORK DONE AND RESULTS OBTAINED.

The first appropriation for this work was made June 14, 1880. The total of appropriations to include that of June 3, 1896, is $229,750. The total expended to June 30, 1896, is $210,305.17. It resulted in a dredged channel 105 feet wide and 22 feet deep at Potopotank Bar and a channel through West Point Bar 22 feet deep and from 160 to 260 feet in width. This latter channel shoaled and narrowed in parts and was redredged. A training dike 7,639 feet in length was constructed at West Point Bar. The last dredging done was in 1895 at West Point Bar.

OPERATIONS FOR THE FISCAL YEAR ENDED JUNE 30, 1897.

An examination of the work at West Point Bar made in April, 1897, showed that the part of the channel dredged in 1895 was in serviceable condition, it having a navigable depth of 22 feet or more and a width of 150 to 200 feet.

BENEFIT TO COMMERCE AND NAVIGATION.

A large and important commerce has been benefited by this improvement. West Point has been for many years the cotton-shipping point for the Southern Railway Company, and 72,235 tons of cotton and 206,706 tons of general merchandise were shipped here in 1894, the total tonnage of that year being 379,808. Seven hundred and fifty-eight steamers drawing over 10 feet arrived and cleared in 1894, a large proportion being ocean steamers carrying cotton to foreign ports. In connection with this attention is invited to commercial statistics herewith. The Southern Railway Company has recently established a new terminal and shipping point at Norfolk, Va. The freight carrying on the river has considerably fallen off in consequence, as reported, of this transfer. Statistics of the commerce of the river for the years 1891–1894 are appended to this report. Repeated efforts have been made to procure statistics for subsequent years, but it has been impossible to obtain them. As bearing upon this matter of the commerce of the river, letters were addressed to several lines interested in the navigation of the river. Following are copies of the correspondence:

UNITED STATES ENGINEER OFFICE,
Washington, D. C., June 11, 1897.

DEAR SIR: The project for the improvement of York River proposes a channel 400 feet wide and 22 feet deep at low tide through Potopotank and West Point bars, these dimensions of channel having been proposed to accommodate the ocean-going steamers which have heretofore received their cargoes at West Point, Va. The recent removal by your company of the terminal and plant for cotton shipments from West

Point to Norfolk, Va., raises the question as to whether the present and future needs of commerce at West Point may not be sufficiently met by a channel of smaller dimensions.

I should be greatly obliged for an expression of your views on this subject, and for a statement as to the number and draft of steamers which now or are likely, within a few years, to be engaged in the transportation of passengers or freight forwarded over your lines to or from West Point, Va.

Very respectfully,

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers.

Mr. W. H. GREEN,
General Superintendent Southern Railway Company.

SOUTHERN RAILWAY COMPANY,
OFFICE OF GENERAL SUPERINTENDENT,
Washington, D. C., June 14, 1897.

DEAR SIR: On my return this morning I find yours of the 11th. In reply would say West Point, Va., is one of the water terminals of this company, and will remain so. We are not only prepared but it is our purpose to handle foreign shipments of cotton, etc., from that point when offered.

I think channel 400 feet wide and 22 feet deep at low tide through Potopotank and West Point bars should be given; in fact, it would be better for commerce if the channel was 25 feet.

Yours, truly,

W. H. GREEN.

Lieut. Col. CHARLES J. ALLEN,
Corps of Engineers.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., June 11, 1897.

DEAR SIR: The plan for improvement of York River, Virginia, which has been in progress for a number of years past, as appropriations have been made by Congress, proposed to secure a channel 400 feet wide and 22 feet deep at low water through Potopotank and West Point bars: These dimensions of channels were proposed with a view to accommodating the large ocean-going steamers which have heretofore received cargoes at West Point, Va.

The recent removal of the Southern Railroad terminal from West Point to Norfolk, Va., raises the question whether depths of 22 feet in York River are now necessary, and whether the present and future needs of commerce may not be met by channels of less depth than 22 feet and less width than 400 feet.

I should be greatly obliged for an expression at an early day of your views in this matter, and also for a statement as to the number and draft of steamers which are now engaged in navigation of the York River, as well as those which are likely within a few years from now to be engaged in the transportation of passengers or freight on that river.

Very respectfully,

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers.

PRESIDENT OF THE OLD DOMINION STEAMSHIP COMPANY,
New York City.

A similar letter was addressed to the president of the York River line of steamers, No. 530 Light street, Baltimore, Md.

OLD DOMINION STEAMSHIP COMPANY,
New York, June 14, 1897.

DEAR SIR: I have yours of the 11th, referring to contemplated improvements in the channel of the York River near West Point.

In reply I beg leave to say that I am not personally sufficiently familiar with the navigation of the York River to be justified in expressing any opinion. The removal of the terminal station of the Southern Railway from West Point has obviated the necessity for large vessels going there, and I presume it is rare that a vessel drawing 18 feet of water will go up there.

Very few coastwise steamers draw 20 feet. The largest ships that we have are sometimes loaded to 19 feet, but very rarely, and I assume that the York River and Baltimore boats do not draw over 14 feet.

While I do not wish to discourage the improvement of the river, I have some doubt as to its advisability under the present circumstances.

Very respectfully,

H. A. BOURNE, *President.*

CHARLES J. ALLEN,
Lieutenant-Colonel, Corps of Engineers.

[Baltimore, Chesapeake and Richmond Steamboat Company—Baltimore and Norfolk Line—York River Line.]

BALTIMORE, *June 17, 1897.*

DEAR SIR: I am in receipt of your letter of June 11, referring to the appropriations made by Congress to secure a channel 400 feet wide and 22 feet deep at low water through Potopotank and West Point bars.

The Southern Railway Company, a system of about 6,000 miles, permeating as it does the entire South, have now three deep-water termini, one at Brunswick, Ga., one at Norfolk, Va., and still propose to retain and operate such portions of their through traffic when same can be done profitably through West Point.

I therefore do not consider that the transfer, for the time being, of a portion of the coastwise and foreign traffic from West Point to Norfolk should in any way preclude the necessity of deepening the channel in such manner that would be of material benefit, both to the present and future needs of commerce at the latter port, as I am well advised that the Southern Railway Company do not contemplate abandoning West Point, but on the contrary it is their purpose to handle foreign shipments of cotton, tobacco, and other products via West Point at any and all times that same can be done equally as advantageously as from other ports.

I do not consider that the number and draft of steamers which are now engaged in the operation of the York River for the moment should in any way affect this proposed improvement, from the fact that we do not know at what time necessity may require us to materially increase our steamer movement to that port, and without restriction as to their draft of water.

Respectfully,

REUBEN FOSTER.

CHARLES J. ALLEN,
Lieutenant-Colonel, Corps of Engineers.

CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE PROJECT.

Up to 1894 the absence of contraction works prevented the securing permanent results from the dredging at West Point Bar. The dike at that bar, constructed in 1893 and 1894, is evidently having good effect in maintaining the dredged depth, and its extension is desirable.

The ruling depth from the sea to West Point may be stated as 20 feet at low tide.

The work remaining to be done under the approved project is completion of dredging at Potopotank and West Point bars and completion of the dike at the latter-named bar.

In view of the above-noted change in present trade conditions, reported as largely due to the establishment of a new shipping terminal at Norfolk, Va., the necessity for undertaking to immediately complete the dredging through the bars to the extreme width of 400 and depth of 22 feet contemplated in the project becomes a question for careful consideration. The United States has, however, already expended nearly $211,800 on this improvement, and it would undoubtedly be a judicious expenditure of money to complete at present such portions of the project as would maintain the channels already dredged so that, whenever required, work under the full project could be resumed. As already stated, the dike at West Point Bar is having good effect in maintaining the dredged depth at that bar. The extension of this dike for about 3,500 feet to a point about opposite the lower end of the second reach of the channel would, it is believed, maintain this part of the channel and be an advisable expenditure.

It is also desirable that a complete survey of the two bars, Potopotank and West Point, be made in order to ascertain their exact present condition and the amount of dredging yet required for their channels.

Former appropriations will be applied during the present year to work under the present project.

The work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, in the Fifth light-house district.

Money statement.

July 1, 1896, balance unexpended	$19,444.83
June 30, 1897, amount expended during fiscal year	1,472.95
July 1, 1897, balance unexpended	17,971.88
July 1, 1897, outstanding liabilities	10.00
July 1, 1897, balance available	17,961.88
Amount (estimated) required for completion of existing project	79,050.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$10,000	September 19, 1890	$30,000
March 3, 1881	25,000	July 13, 1892	35,000
August 2, 1882	25,000	August 17, 1894	20,000
July 5, 1884	20,000	June 3, 1896	16,000
August 5, 1886	18,750		
August 11, 1888	30,000	Total	229,750

COMMERCIAL STATISTICS.

[Furnished by Mr. E. T. Lamb, West Point, Va.]

Receipts and shipments.

Class of goods.	1891.	1892.	1893.	1894.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Coal	10,960	10,498	10,423	20,000
Cotton	89,227	63,742	67,485	72,235
Farm produce	5,641	3,500	4,000	5,000
Grain	3,220	.....	100	150
Iron	43,897	45,501	45,033	41,227
Lumber	7,848	6,081	7,375	8,175
Oysters	12,400	2,780	3,200	2,500
General merchandise	70,930	191,462	188,054	206,706
Railroad ties	14,140	5,000	6,500	1,600
Tobacco	175	8,500	10,000	12,115
Wood	45,900	8,495	9,220	10,100

Vessels arriving and departing.

Class.	1891.	1892.	1893.	1894.
Steamers drawing 10 feet or more	727	724	792	758
Steamers drawing less than 10 feet	104	208	311	310
Vessels drawing 10 feet or more	178	96	90	95
Vessels drawing less than 10 feet	824	190	204	200
Barges, flatboats, etc	191	18	21	10

Statement of tonnage by years.

Reported for—	Tons.	Reported for—	Tons.
1888	285,480	1892	345,559
1889	328,353	1893	351,390
1890	418,190	1894	379,808
1891	304,338		

Repeated efforts were made to obtain commercial statistics for 1895 and 1896, but they could not be procured.

J 9.

IMPROVEMENT OF MATTAPONI RIVER, VIRGINIA.

The Mattaponi and Pamunkey rivers unite at West Point, Va., to form the York River. The Mattaponi is navigable for small steamers and vessels from its mouth, at West Point, to Aylett, a distance of 38.8 miles, and can be made navigable for small barges for 16 miles above Aylett, to Monday Bridge. The obstructions to 5.5-foot navigation below Aylett are as follows:

Designation.	Distance above West-point, Va.	Length of bar.	Ruling depth at low tide.
	Miles.	*Feet.*	*Feet.*
Line Tree Bar	31.4	2,100	3.8
Latané Bar	32.9	4,500	3
Robinson Bar	33.9	3,500	2.8
Presque Isle Bar	35.1	1,600	3.2
Sale Bar	35.6	1,000	3.1
Walker Bar	36.4	1,900	2.4
Jones Bar	37.3	950	3.1

Above Aylett there are numerous bars, but no work on them was proposed. The river was also obstructed by snags, overhanging trees, and wrecks.

PLAN OF IMPROVEMENT AND PRESENT PROJECT.

The original project, adopted in 1880, provided for the removal of snags, logs, leaning trees, wrecks, etc., below Monday Bridge and the improvement of the bars below Aylett, so as to give a depth of 5.5 feet at low tide and a channel width of 40 feet.

This project was extended by the terms of the river and harbor act of July 13, 1892, which provided for the removal of snags up as far as Guineas Bridge, near Milford Station, on the Richmond, Fredericksburg and Potomac Railroad. Estimated cost of project, $72,100.

WORK DONE AND RESULTS OBTAINED.

From June 14, 1880, to June 3, 1896, nine appropriations were made for this improvement, aggregating $29,800. Of this sum there was expended to June 30, 1896, inclusive, $24,501.80, which resulted in the removal of snags, logs, and overhanging trees from the river between Robinson Bar and Monday Bridge and in keeping the river below Aylett clear of such obstructions, and also in the construction of 2,297 linear feet of dike at Robinson Bar.

The field operations of the fiscal year ended June 30, 1897, consisted in examinations of Line Tree and Latané bars. Under date of June 25, 1897, advertisement was issued inviting proposals for dredging at those bars, and also for dredging in Pamunkey River, Virginia. It is proposed to include both these works in one contract.

Amount expended during fiscal year 1897, $292.41 in survey and engineering and office expenses.

BENEFIT TO COMMERCE AND NAVIGATION.

The work already done upon this river has been of benefit to existing commerce, notwithstanding that much of it has had to be done over again, as snags and other obstructions form in greater or less degree after every freshet. Before any work of improvement was undertaken the trade was limited. There is now one steamer plying between West Point and Walkerton (29 miles). Above this point a lighter draft

steamer runs to Aylett, 38.8 miles above West Point. Below Walkerton numerous vessels load with wood, lumber, etc., for coast ports. The total freight tonnage for 1894 was 39,300 tons. In this connection see commercial statistics herewith.

PRESENT CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

The snags, logs, and similar obstructions have been removed between Robinson Bar and Monday Bridge. Robinson Bar has been partly improved by the construction of dikes.

The work remaining to be done under the existing project is as follows: The completion of the dikes at Robinson Bar and the construction of those proposed at Latané Bar and the dredging of channels at all of the bars below Aylett having a ruling depth of less than 5.5 feet. Snags and fallen trees accumulate each year and will require removal.

With the funds available from the appropriation of $2,500 by the act of June 3, 1896, and the balance ($2,500) of funds available from preceding appropriations, it is proposed to do the dredging, proposals for which were invited by advertisement June 25, 1897.

The sum of $3,500 can be profitably expended during the fiscal year ending June 30, 1899, in dredging and removal of obstructions.

The work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, Virginia.

Money statement.

July 1, 1896, balance unexpended	$5,298.20
June 30, 1897, amount expended during fiscal year	292.41
July 1, 1897, balance unexpended	5,005.79
July 1, 1897, outstanding liabilities	5.00
July 1, 1897, balance available	5,000.79
Amount (estimated) required for completion of existing project	42,300.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$2,500	July 13, 1892	$4,000
March 3, 1881	3,300	August 17, 1894	4,000
July 5, 1884	2,500	June 3, 1896	2,500
August 5, 1886	5,000		
August 11, 1888	3,000	Total	29,800
September 19, 1890	3,000		

COMMERCIAL STATISTICS.

Receipts and shipments.

Class of goods.	Calendar year—				
	1890.	1891. *a*	1892. *a*	1893. *a*	1894. *a*
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Coal	.....	.....	.....	.....	1,000
Farm products	.....	2,400	.....	300	500
Grain	.....	1,000	.....	100	350
Lumber	7,700	1,200	5,500	6,200	6,000
Merchandise	10,400	3,120	15,570	17,820	16,000
Ties	6,900	5,640	5,000	5,260	3,200
Wood	7,650	38,700	6,620	6,740	12,250
Total	32,650	52,060	32,690	36,420	39,300

a Furnished by Mr. E. T. Lamb, Westpoint, Va.

Vessels arriving and departing during 1894.

Class.	Number.	Tonnage.
Steam, drawing less than 10 feet	175	9,000
Sail, drawing 10 feet or more	100	30,000
Sail, drawing less than 10 feet	90	15,000
Barges, flatboats, etc	5	400
Total	370	54,400

Repeated efforts were made to obtain commercial statistics for 1895 and 1896, but they could not be procured.

J 10.

IMPROVEMENT OF PAMUNKEY RIVER, VIRGINIA.

The Pamunkey River is navigable from its mouth at West Point, York River, to Hanovertown or Dabney Ferry, a distance of about 59 miles. Seven feet of depth at low water can be carried to Buckland Bar, 38½ miles above West Point. Above this bar are six other bars extending along the river for a distance of about 15¼ miles, on which the ruling depths vary from 1½ to 5½ feet, excepting on the upper, or Indian Table, bar, which is exposed at low tide. In addition to these bars navigation was originally obstructed by numerous wrecks, logs, snags, and overhanging trees.

PLAN OF IMPROVEMENT AND PRESENT PROJECT.

The project for the improvement, adopted in 1880 and amended in 1885, provided for 7-foot navigation from West Point to Bassett Ferry, 47 miles; thence 5-foot navigation to Wormley Landing, 54 miles above West Point, and thence 3-foot navigation to Hanovertown, the 7-foot channel to be 100 feet wide and the remainder 40 feet wide.

The wrecks, snags, logs, and trees obstructing navigation between Garlick Ferry and Hanovertown were also to be removed.

The cost of this amended project, and which is the present project, was estimated as $28,500.

WORK DONE AND RESULTS OBTAINED.

From June 14, 1880, to June 3, 1896, inclusive, the total of appropriations for this improvement was $25,500. The amount expended to include June 30, 1896, was $21,509.01. It resulted in the following work: The necessary snagging plant was constructed for use on this and contiguous streams, and all logs, snags, and overhanging trees obstructing navigation removed from the upper part of the river between Hanovertown and Whitehouse, a distance of 30 miles, the snagging operations having been repeated under successive appropriations in order to remove the obstructions brought in by freshets each year. Parts of wrecks obstructing navigation have been removed as follows: Three at Skidmore Bar, three at Carters Island, and one at Whitehouse. Nine hundred and eleven feet of sheet pile dike have been constructed at Skidmore and Spring Bars, 630 linear feet of brush shore protection has been built at Skidmore Bar, and a channel 800 feet long,

95 feet wide, and from 6 to 7 feet deep has been dredged through Skidmore Bar.

The amount expended during the fiscal year ended June 30, 1897, was $308.15. Field operations during this year consisted in an examination of several of the bars.

Under date of June 25, 1897, advertisement was issued inviting proposals for dredging to be opened July 24, 1897. The dredging which it is proposed to do this season is to be under the same contract with that proposed for Mattaponi River.

BENEFIT TO COMMERCE AND NAVIGATION.

The trade of this river in 1894 amounted to a freight tonnage of 42,250 tons, the greater part of which was in railroad ties and wood. There is not a large trade above Whitehouse and scarcely any on the 5 miles next below Hanovertown. In this connection please see commercial statistics herewith for 1893 and 1894. Repeated efforts to procure statistics for later years have not been successful.

PRESENT CONDITION OF THE IMPROVEMENT AND FUTURE WORK REQUIRED TO COMPLETE THE APPROVED PROJECT.

The snags, logs, and similar obstructions have been removed and the river kept clear for sixteen years. Skidmore Bar has been improved by dredging and dikes, and Spring Bar has been partly improved by dikes.

The work remaining to be done to complete the existing project is the dredging of channels and the construction of dikes at the several bars still obstructing navigation, and the removal of the annual accumulations of snags and logs.

The sum of $3,000 can be profitably expended during the fiscal year ending June 30, 1899, in dredging and in removal of snags, logs, and wrecks.

The work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, Virginia.

Money statement.

July 1, 1896, balance unexpended	$3,990.99
June 30, 1897, amount expended during fiscal year	308.15
July 1, 1897, balance unexpended	3,682.84
July 1, 1897, outstanding liabilities	5.00
July 1, 1897, balance available	3,677.84
Amount (estimated) required for completion of existing project	3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$2,500	July 13, 1892	$3,000
March 3, 1881	2,500	August 17, 1894	2,000
August 2, 1882	2,500	June 3, 1896	2,000
August 5, 1886	5,000		
August 11, 1888	3,000	Total	25,500
September 19, 1890	3,000		

COMMERCIAL STATISTICS.

[Furnished by Mr. E. T. Lamb, West Point, Va.]

Receipts and shipments.

Articles.	1893.	1894.
	Tons.	*Tons.*
Coal	.....	5,000
Grain	75	750
Ice	5,145	.....
General merchandise	100	10,000
Lumber	10,000	1,000
Railroad ties	15,000	15,000
Wood	20,100	10,500
Total	50,420	42,250

Repeated efforts were made to obtain commercial statistics for 1895 and 1896, but they could not be procured.

J 11.

IMPROVEMENT OF JAMES RIVER, VIRGINIA.

[This work was in the charge of Col. Peter C. Hains, Corps of Engineers, until July 31, 1896.]

The present project for improvement of this river is in accordance with the act of Congress of July 5, 1884. It has in view the obtaining a depth of 22 feet at mean low tide from the sea to Richmond, the channel widths to be 400 feet from the sea to City Point, 300 feet thence to Drewry Bluff, and 200 feet thence to Richmond. The estimated cost of this project, which was a modification of the original project, is $4,500,000. The work for accomplishing this effect has been excavation through shoals by dredges, removal of rock, and construction of dikes and jetties to regulate the waterway in part. Work has been generally done first on the shoalest places in the river, with a view to obtain the greatest benefit to commerce in the shortest time. Solid rock excavation has constituted a large item of the work, and more of the same remains to be done. It is necessarily costly.

During the fiscal year ended June 30, 1897, a contract has been in force with Mr. P. Sanford Ross, dated December 11, 1894, and approved December 14, 1894, for dredging and removal of rock, to be completed August 1, 1897. Also a contract with Mr. John A. Curtis, dated October 26, 1895, and approved November 11, 1895, to be completed December 31, 1896, for dredging, construction of wing dams, and repair of brush dikes.

The amount of excavation done during the fiscal year by Mr. Ross under his contract was as follows:

	Cubic yards.
Earth excavation	18,111.3
Cobble	1,075.2
Soft rock	26,497.5
Solid rock	6,875.8
Total	52,559.8

The amount of dredging by Mr. Curtis under his contract during the fiscal year was:

	Cubic yards.
Earth	5,925.5
Cobble	752.1
Solid rock	2.2
Total	6,679.8

The work on wing dams and dikes done by Mr. Curtis during the year consisted of the following:

Pine piles, driven and cut off	linear feet	7,374.3
Oak or cypress piles, driven and cut off	do	968.5
Sheet piling, driven and cut off	feet B. M.	91,190
Waling in place, driven and cut off	do	22,290
Pine capping, driven and cut off	do	18,684.3
Brush in dikes	cubic feet	12,600
Ballast in dikes	tons	7,173.4

The total length of wing dams built during the fiscal year was 2,737½ feet.

Examinations were made of Dancing Point and Swans Point shoals, distant, respectively, 59 and 65 miles from Richmond, and soundings were taken between the ends of opposite wing dams over more or less of the river for 20 miles below Richmond, and a survey with soundings was also made in the latter part of September, 1896, from the lower city line to Rocketts Reef.

The amount expended from commencement of the work to June 30, 1896, was $1,634,198.41, with the result that 16½ feet of water at low tide could be carried from the sea to the lower city limits of Richmond.

The amount expended during the fiscal year ended June 30, 1897, was $68,331.70. It resulted in further improvement, so that 18 feet at mean low tide can now be carried from the sea to within 1,600 feet of the lower city limits of Richmond. At high tide a depth of 19½ feet is available up to the lower city line. A saving of about 5½ miles of difficult navigation has also been effected by the opening of Dutch Gap Cut-off.

The value of the improvement already effected, the need of further improvement, and the relation of the same to the commerce of the river may be appreciated from the statistics appended to this report.

With the balance of funds remaining from the appropriations it is proposed to continue, during the present season, the removal of rock and repair and construction of dikes, and to care for the engineer plant.

The sum of $400,000 can be profitably expended under the project during the fiscal year ending June 30, 1899. The best results for this work can be obtained from liberal appropriations, which would in the end be most economical for the United States.

Money statement.

July 1, 1896, balance unexpended		$138,301.59
June 30, 1897, amount expended during fiscal year		68,331.70
July 1, 1897, balance unexpended		69,969.89
July 1, 1897, outstanding liabilities	$1,050.00	
July 1, 1897, amount covered by uncompleted contracts	25,000.00	
		26,050.00
July 1, 1897, balance available		43,919.89
Amount (estimated) required for completion of existing project		3,467,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		400,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

The following appropriations have been made for this work:

July 11, 1870	$50,000	August 2, 1882	$75,000
March 3, 1871	50,000	July 5, 1884	75,000
June 8, 1872	50,000	August 5, 1886	112,500
March 3, 1873	75,000	August 11, 1888	225,000
June 23, 1874	50,000	September 19, 1890	200,000
March 3, 1875	50,000	July 13, 1892	200,000
August 14, 1876	60,000	August 17, 1894	100,000
June 18, 1878	70,000	June 3, 1896	120,000
March 3, 1879	75,000		
June 14, 1880	75,000	Total	1,772,500
March 3, 1881	60,000		

The following contracts were in force during the year: P. Sanford Ross, dredging and removal of rock, dated December 11 and approved December 14, 1894; date of commencement, January 10, 1895; date of completion, August 1, 1897. John A. Curtis, dredging, construction of wing dams, and repair of brush dikes, dated October 26 and approved November 11, 1895; date of commencement, November 15, 1895; date of completion, December 31, 1896.

COMMERCIAL STATISTICS.

Receipts and shipments, in tons, by water during the calendar year 1896.

Articles.	Port of Richmond, Va.			Points on James River other than Richmond, Va.			Total tonnage.
	Receipts.	Shipments.	Amounts.	Receipts.	Shipments.	Amounts.	
Brick	389	120	509	1,300	6,400	7,700	8,209
Coal	51,361	1,559	52,920	3,514	.....	3,514	56,434
Farm produce	.....	.....	.....	260	1,107	1,367	1,367
Fertilizers	37,262	1,809	39,072	2,042	.....	2,042	41,113
Flour	.....	.....	.....	333	.....	333	333
General merchandise	72,281	24,290	96,571	15,139	16,272	31,411	127,982
Grain	1,381	.....	1,381	.....	2,864	2,864	4,245
Ice	17,280	.....	17,280	280	.....	280	17,560
Iron	2,413	13,283	15,696	1,100	.....	1,100	16,796
Lime, cement, and plaster	7,683	45	7,728	572	.....	572	8,300
Lumber	1,588	3,670	5,258	130	139,405	139,535	144,793
Oysters and fish	1,156	.....	1,156	.....	304	304	1,460
Railroad ties	.....	99,848	99,848	.....	25,903	25,903	125,751
Salt	5,657	.....	5,657	.....	.....	.....	5,657
Stone	.....	1,600	1,600	.....	.....	.....	1,600
Tobacco	.....	9,183	9,183	.....	.....	.....	9,183
Wood and bark	29,350	2,055	31,305	.....	78,747	78,747	110,152
Total receipts and shipments	227,801	157,462	385,263	24,670	271,002	295,672	680,935

Tonnage by years.

1890	743,122	1894	616,269
1891	739,308	1895	602,582
1892	616,755	1896	680,935
1893	663,625		

Arrivals and departures of vessels, 1896.

Class.	Port of Richmond, Va.		Points on James River other than Richmond.	
	Number.	Tonnage.	Number.	Tonnage.
Steam, drawing 8 to 16 feet	1,128	1,141,420	.....	.....
Sail, drawing 4 to 17 feet	858	327,616	1,690	322,310
Barges, flatboats, etc	280	28,000	.....	.....
Total	2,266	1,497,036	1,690	322,310

Statement of the commerce of the port of Richmond, Va., for the calender year ending December 31, 1896.

[Furnished by the collector of customs.]

Vessels entered from foreign ports	1
Vessels entered from domestic ports	624
Vessels cleared for domestic ports	624
	1,248
Valne of imports, free	$60,182
Value of imports, dutiable	56,368
Total value of imports	116,550
Total amount of duty collected	24,115

A new line of steamers making triweekly trips between Richmond and Baltimore was established in 1896.

J 12.

PROTECTION OF JAMESTOWN ISLAND, VIRGINIA.

[This work was in the charge of Col. Peter C. Hains, Corps of Engineers, until July 31, 1896.]

The river and harbor act of August 18, 1894, contained the following item:

Protecting Jamestown Island from the encroachments of James River, ten thousand dollars, or so much thereof as may be necessary.

Abrasion of the shore of the island had been going on for years, and had reached a condition that required checking if the old landmark was to be preserved. The injury has been caused by the action of the waves raised by the winds mainly in the broad stretch above. These waves undermined the banks. The worst winds are from northwest to west; next, those from southeast to south; but north and south winds are also hurtful.

The plan adopted was to build a wall faced with granite, laid without mortar, in front of the threatened part of the island, to grade and turf the bluff behind it, and to add several groins in front of the wall. This work was completed June 5, 1895, under a contract dated December 26, 1894. Amount expended to June 30, 1896, inclusive, $9,174.92.

The soil of the island is light and easily moved. The funds did not admit of covering the front requiring protection with the kind of work desirable. Storms, especially those of the winter of 1895 and 1896, greatly damaged the protection work.

The river and harbor act of June 3, 1896, appropriated for this work as follows:

Protecting Jamestown Island from the encroachments of James River, fifteen thousand dollars, or so much thereof as may be necessary.

Examination of the eroded front was made during the winter of 1896 and 1897, and a project for the application of the appropriation of 1896 was submitted in April following. Amount expended during the fiscal year ended June 30, 1897, in survey and incidental expenses, $99.53.

The length of bank requiring immediate protection is about 2,600 feet. The money available for protection work is as follows:

Balance from old appropriation, about	$700.00
Appropriation of 1896	15,000.00
Total	15,700.00

This sum affords about $6 per running foot of bank to be protected, and which is inadequate for as thorough and solid a protection as is to be desired.

The plan for the work, based upon the funds available and with a view to covering, if possible, the entire portion subject to erosion, contemplates regrading the bank and levee where necessary, bringing it to a regular and even slope, and covering it with a slope wall of good-sized stone laid in hydraulic mortar, the toe of the stone slope wall to be protected by riprap and concrete block, so far as the funds will admit of. It is possible that a further expenditure may be needed for reinforcement of the toe of the slope, but no estimate for it is rendered herein.

It is proposed to commence the protection work, with the funds available, as soon as satisfactory preliminary arrangements with reference to the occupation of the ground are reported as having been made, and which, it is hoped, will be at an early day; the work to be done by contract, after advertisement in the usual manner.

There are no commercial statistics pertaining to this work to report.

Money statement.

July 1, 1896, balance unexpended	$15,825.08
June 30, 1897, amount expended during fiscal year	99.53
July 1, 1897, balance unexpended	15,725.55

J 13.

SURVEY OF CHAPEL POINT HARBOR, MARYLAND.

[Printed in House Doc. No. 266, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 3, 1897.

SIR: I have the honor to submit the accompanying copy of report of January 26, 1897, by Maj. Charles J. Allen, Corps of Engineers, giving the results of survey of Chapel Point Harbor, Maryland, made in compliance with the terms of the river and harbor act of June 3, 1896.

In this report estimates are submitted for channels of 10 and 15 feet depth each, over two different routes, from wharf at Chapel Point to the channel of the Potomac River. The estimated cost of these channels ranges from $52,800 to $330,000. Attention is also invited to report dated December 13, 1894, on preliminary examination to comply with provisions of the river and harbor act of August 17, 1894, made by Major Davis, in which the opinion was expressed that this locality was not worthy of improvement by the General Government (see Annual Report of Chief of Engineers, 1895, pp. 1252–1254), and in this connection Major Allen states that he is unable to see "that any good reason exists to-day for the expenditure by the United States of any money for the improvement of Chapel Point Harbor."

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. CHAS. J. ALLEN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., January 26, 1897.

GENERAL: I have the honor to submit the following report of a survey at Chapel Point Harbor, Maryland, made in accordance with the provisions of section 9 of the river and harbor act of Congress, June 3, 1896.

The survey was made in October last by Mr. E. D. Hardy, assistant engineer from this office. It consisted in soundings over the usual course of vessels in entering and leaving the harbor. A tracing* from the map of the survey is herewith.

The soundings, so far as made, indicated about the same depths as were found during the United States coast survey of 1862–63. It would have been interesting and advantageous to have extended the soundings of October last over a much larger area, in order to have more fully tested the question as to change, if any, in depth, but that would have cost more money than was available.

Chapel Point Harbor, or Port Tobacco River, as it is called on the Coast Survey chart, is an arm of the Potomac River entering the latter from the left bank at a point about 56 miles, by river, below Washington.

The following general description is from the report of Mr. Hardy, dated November 6, 1896:

> The adjacent shores of the harbor are generally cleared and tilled. There are two wharves used as steamboat landings, one being at Chapel Point and the other, which is nearly opposite, is known as Brent's wharf. Near Brent's wharf there are only a few farm buildings and a small warehouse, which is situated on the wharf. At Chapel Point there is a summer hotel, said to be capable of accommodating 150 people, a steam gristmill, a clubhouse, and a store, post-office, and dwelling combined. There is also a Catholic church within about one-fourth of a mile of the point.
>
> Chapel Point Harbor is said to have been formerly a port of considerable importance, as large quantities of tobacco and other farm products were raised and shipped to Baltimore and Washington. Owing to its low market price and other reasons, comparatively little tobacco is now raised in this vicinity. A railroad has been built to Bel Alton, or Cox Station, a distance of about 3 miles from Chapel Point, which naturally carries considerable quantities of produce, etc., thus diminishing the amount shipped by water proportionally.
>
> According to Mr. Alram Biles, wharf agent at Chapel Point, there is one steamer, the *Harry Randall*, having a registered net tonnage of 418.25, about 30 sailing vessels, of a tonnage between 5 and 50, and 3 barges carrying freight to and from Chapel Point Harbor. The *Harry Randall* makes three regular trips each week down the Potomac, between Washington and Colonial Beach, making landings at both the wharves in Chapel Point Harbor each way. The other vessels make no regular trips, but carry occasional cargoes of oysters, grain, etc.
>
> The principal articles of import are lumber and general merchandise, and amount to about 2,000 tons annually. The principal exports are grain, railroad ties, and wood, and amount to about 1,500 tons annually.

In connection with this description, reference is respectfully made to Chart No. 390 of the United States Coast and Geodetic Survey.

Estimates of cost of dredging channels along the lines ABC, and DEF, were made, viz:

For a channel along the line ABC, which is the shortest route from the wharf at Chapel Point to the main channel of the Potomac River, and the one usually followed by vessels:

The channel to be 150 feet wide and 10 feet deep, requiring 317,200 cubic yards dredging, at 20 cents per cubic yard	$63,440
Contingencies, 10 per cent	6,344
	69,784

* Not printed.

Also for a channel 150 feet wide and 15 feet deep, requiring 987,000 cubic yards dredging, at 20 cents yer cubic yard	197,400
Contingencies, 10 per cent	19,740
	217,140

The length of the channel ABC is about 3½ miles.

For a channel, DEF, near the left bank of Port Tobacco River, from Chapel Point to the channel of the Potomac River near Popes Creek Landing:

The channel to be 150 feet wide and 10 feet deep, requiring 240,000 cubic yards of dredging, at 20 cents per cubic yard	$48,000
Contingencies, 10 per cent	4,800
	52,800

Also for a channel 150 feet wide and 15 feet deep, requiring 1,500,000 cubic yards of dredging, at 20 cents per cubic yard	300,000
Contingencies, 10 per cent	30,000
	330,000

The length of the channel DEF, near the left bank of Port Tobacco River, is about 5 miles.

The estimates for the line DEF are necessarily approximate, being based upon a limited number of soundings taken a number of years ago.

The bottom for all the foregoing channels is believed to be generally soft mud, with a few hard places of limited area, and which seemed to consist of oyster shells.

A preliminary examination of Chapel Point Harbor was made September 16, 1894, by Major Davis, Corps of Engineers, in order to comply with the provisions of the river and harbor act of August 17, 1894. The report was printed in House Executive Document No. 135, Fifty-third Congress, third session. It is also printed in Appendix I, Annual Report of the Chief of Engineers for 1895, pages 1252–1254. The harbor was not regarded as worthy of improvement by the General Government, the views of the engineer officer in that respect having been concurred in by the division engineer and the Chief of Engineers. The engineer officer closed his report in the following words:

> Those interested in the improvement of Chapel Point desire that the depth of water be increased so that the Washington, Norfolk, and Baltimore steamers can make easy landings and make use of it as a winter harbor when the upper Potomac is closed by ice; freight and passengers to be then forwarded by the proposed railroad. While Chapel Point Harbor, if improved, would make a fair ice harbor, it may be stated that the closing of the Potomac River by ice is so infrequent that an expenditure at this point for this object would not be justified.
>
> I do not think the present or prospective demands of commerce are sufficient to warrant the improvement of this harbor as a public necessity, and therefore I do not regard it as worthy of improvement by the General Government.

I am unable to see that any good reason exists to-day for the expenditure by the United States of any money for the improvement of Chapel Point Harbor.

If in the future appropriations should be made for improvement, a thorough survey of the portion of the harbor near to and along the left bank of Port Tobacco River from Chapel Point to the channel of the Potomac River should be made before definitely locating the line for dredging.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

APPENDIX K.

IMPROVEMENT OF NORFOLK HARBOR, VIRGINIA, AND ITS APPROACHES, AND OF RIVERS AND HARBORS IN SOUTHEASTERN VIRGINIA AND NORTHEASTERN NORTH CAROLINA.

REPORT OF CAPT. THOS. L. CASEY, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Harbor of Norfolk, and its approaches, Virginia.
2. Western Branch of Elizabeth River, Virginia.
3. Nansemond River, Virginia.
4. Appomattox River, Virginia.
5. Harbor at Cape Charles City, Virginia.
6. Nandua Creek, Virginia.
7. Inland water route from Norfolk, Virginia, to Albemarle Sound, North Carolina, through Currituck Sound.
8. North Landing River, Virginia and North Carolina.
9. Roanoke River, North Carolina.
10. Pasquotank River, North Carolina.
11. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

12. Cashie River, North Carolina.
13. Potecasi Creek, North Carolina.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., July 16, 1897.

GENERAL: I have the honor to transmit herewith my annual report upon the works of river and harbor improvement in my charge during the fiscal year ended June 30, 1897.

Very respectfully, your obedient servant,

THOS. L. CASEY,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

K 1.

IMPROVEMENT OF HARBOR AT NORFOLK, AND ITS APPROACHES, VIRGINIA.

An appropriation of $100,000 was made in the act of June 3, 1896, for this improvement and a project for the expenditure of the above amount in dredging was submitted June 24, 1896, and approved July 10, 1896, the work to be done by contract after advertisement in the usual manner.

Specifications for the work contemplated under this project were issued and proposals duly invited on August 13, 1896. The proposals received were opened publicly on September 28, 1896 (abstract appended), the lowest bid received being that of the Morris & Cumings Dredging Company, of New York, N. Y., at 8¾ cents per cubic yard, scow measurement. This bid was accepted and a contract entered into under date of October 7, 1896.

The work of dredging under this contract commenced October 20, 1896, and was completed May 8, 1897, a total of 961,162 cubic yards of material, scow measurement, having been removed. This material was for the most part mud, and was disposed of by dumping from scows behind the ripraps in Hampton Roads. A map showing the location and extent of the dredging is appended.

Of the total amount removed during the continuance of operations under the contract, 447,877 cubic yards, scow measurement, was taken from Berkley flats between the wharf of the Norfolk and Southern Railroad, in the Southern Branch, and that of the Cummer Lumber Company, in the Eastern Branch. With the exception of a small area between Frey's sawmill and the Norfolk and Southern Railroad wharf, the dredging was carried in to the limiting line of the project, viz, to within 75 feet of the pierhead line. In dredging to 22 feet at ordinary low water through a shoal between Town Point and the Old Dominion dock, in the Eastern Branch, 121,735 cubic yards of material was removed. The channel between the mouth of the Southern Branch and Hospital Point was widened 150 feet for a distance of 2,800 feet, and the channel between the latter and Pinner Point was given an additional width of 75 feet for a distance of 1,500 feet and of 35 feet for a farther distance of 1,700 feet, 308,648 and 82,902 cubic yards of material, respectively, being removed. All dredging in the Eastern Branch was to 22 feet at ordinary low water and the balance to 25 feet at the same stage of the tide.

From one to three dredges were employed in prosecuting the work, with the necessary scow equipment and tugboats.

The channels of the harbor are seemingly in fair condition. The depth to which the present project limits dredging is not sufficient for the needs of the growing commerce of the harbor, nor will it allow the deep-draft vessels of the United States Navy to reach the Norfolk Navy-Yard on the Southern Branch. A depth of 30 feet at ordinary low water would seem to be the proper limit of depth under these circumstances.

The State Board of Harbor Commissioners on November 2, 1896, addressed a communication to the Chief of Engineers, United States Army, in reference to the widening of the harbor by the removal of Hospital Point in the harbor proper and the abutment of the old Toll Bridge in the Eastern Branch. The latter extends about 100 feet beyond the present pierhead line and its removal was recommended by a Board of Engineers constituted by Special Order No. 33, Headquarters, Corps of Engineers, September 25, 1896, convened to examine into and report upon the subject of changes in the established harbor lines in the Eastern Branch of the Elizabeth River, Virginia. A report was submitted November 5, 1896. Upon information being furnished as to the authority under which the bridge was built, and as to the parties owning the abutment, notices requiring removal of the abutment within thirty days were served April 22 and 23, 1897, respectively, on the executor of the estate of Thomas A. Hardy and the president of the Norfolk and Western Railway Company (both claiming the ownership

of the property), notifying them that unless removed within the time specified, its removal would be undertaken by the United States under authority of section 8 of the river and harbor act of September 19, 1890. Before service of notice was made, the Norfolk and Western Railway Company relinquished all claim of ownership to the abutment. The estate of Thomas A. Hardy having failed to remove the obstructing portion of the abutment within the time specified, bids were invited for its removal at the expense of the United States on June 22, 1897.

The land forming Hospital Point is owned by the United States and is under the control of the Navy Department as a site for the United States Navy Hospital at Norfolk, Va. Correspondence has been carried on with the Navy Department with respect to the removal of this point. While no objection is made by the Navy Department to the cutting off of about 400 feet of the point, with corresponding increase in channel width above and below, some difference exists as to the nature of the sea wall that should be built along the shortened point in order to retain the embankment. Copies of all papers on this subject, with some of the indorsements appearing thereon, are appended hereto, so that Congress may have at hand full information as to the necessity of this improvement and the differences between the Departments in the premises.

LETTER FROM PRESIDENT OF STATE BOARD OF HARBOR COMMISSIONERS, WITH INDORSEMENTS APPEARING THEREON.

OFFICE OF STATE BOARD OF HARBOR COMMISSIONERS,
Norfolk, Va., November 2, 1896.

SIR: I have been instructed by the State board of harbor commissioners for the harbor of Norfolk and Portsmouth to address you a communication in reference to the widening of our harbor at the Hospital Point and at the point up the Eastern Branch known as the old drawbridge abutment, on the southern side of said Eastern Branch, and just opposite the western limit of the Norfolk and Western Railway Company's property, on the north side thereof.

In thus communicating to you it is my duty to attempt to show the necessities existing for such widening and the advantages that will accrue therefrom, not only to the port in a commercial sense, but to it as a safe and easy rendezvous for the heavy ships of our Navy, now debarred from such safe and easy rendezvous, not because of lack of proper depth of water any more than from lack of width of water of sufficient depth. I desire to say that while any change in the natural condition of the shores of a waterway maintained by the flow and ebb of the tidal wave may be fraught with danger to the integrity of the channel of such waterway, and therefore is to be avoided wherever it is possible to so avoid it, yet there may arise trade and navigation exigencies which render it imperative that changes in these natural conditions of shore, under which a deep-water channel way has been created, be made, even though by so doing the depth of this channel way be somewhat endangered. It is believed that such exigencies do now confront this harbor. The Government has heretofore bent its energies more particularly toward giving to the harbor a uniform deep channel from Hampton Roads inward, along the main channel way of the Elizabeth River, to a point abreast the United States Navy-Yard, on the Southern Branch, of nearly 27 feet at high water, and of a width of, say, about 500 to 700 feet, and up the Eastern Branch of less depth and less width. By this project it was thought, no doubt, the river would be made sufficiently available to meet all demands which would in years to come be made upon it for all purposes. But the extraordinary increase in commercial enterprises centering in and around Norfolk and Portsmouth has been so great that this fine channel way, so liberally bestowed by the Government to meet the supposed demands, proves to be insufficient, and to-day we find our harbor, both as to depth and width, unable to safely and in some instances to at all accommodate the demands made upon it. I would cite as an instance confirmatory of this that some of our heaviest cruisers and none of our battle ships of first order can come up to the Government dockyard, second only in point of importance to the New York Navy-Yard, if second to that, located on the Southern Branch of this harbor and near its most interior point.

This emergency is, of course, one which the Government, looking, in its wisdom, to the integrity and good conduct of its naval service, will in proper time meet and properly dispose of by making the harbor what it must be in point of deepness of

channel way and also in width of channel. In former times, not very far in the past, to deepen the water with only the present width would have been sufficient. Then all the commercial enterprises of this port were located above Hospital Point; comparatively few merchant ships, steam or sail, entered our harbor, and they were of small size by comparison with such craft as now frequent daily this port, and which are drawn here by the demands of trade and commerce.

Now, also, for some 5 miles below this Hospital Point, on both sides of our river, are built extensive piers, terminal points of railroad systems which enter for thousands of miles into the interior and bring here hundreds of thousands of tons of freight of every description; and that part of the harbor inside of this point has also been filled up almost solidly with just such extension piers for similar purposes. Our harbor during the twenty-four hours of the day is filled with craft of sizes varying from the 6,000 to 8,000 ton steamship to the sloop of only a few tons, embracing between these extremes a great number of barges carrying from 500 to 1,000 tons of freight moved by busy tugboats, all at work to accommodate the increased trade which the past outlay of the Government on our harbor has done so much to attract, because that outlay has greatly tended to make such trade possible. Thus the good offices of Government, extended by the expenditure of the public funds, have been justified by the ready appreciation of a busy and energetic people embracing the citizenship of the country at large, and not merely local, the result of the expenditure being clearly a national benefit.

It is doubtful whether any other port can show pro rata a greater return for the public funds spent within its confines to the general public than can this harbor of Norfolk and Portsmouth.

Feeling that this is so, the State board of harbor commissioners approaches the proper authorities with confidence, to ask that the points which constrict our harbor and which, while they remain, render safety of navigation, as that navigation to-day exists and which is steadily growing, unsafe to life and property, both private and public.

The first of these points in importance is Hospital Point, owned by the Government. This point is on the north and west side of the main channel of the Elizabeth River immediately opposite to the most crowded part of wharf and pier property of Norfolk City. It juts out into the river just where the Southern and Eastern branches effect a junction, forming an angle, say, of from north to northwest or west-northwest. Around this point, which creates a stricture, a vast proportion of the craft of all sorts navigating our harbor passes almost continuously at all hours and in all weathers. Constant danger exists in consequence to life and property, and constant loss of time, an element so essential in these days to prosperity. So narrow is this particular point in the river that it is growing to be next to impossible to properly handle the steamships of 300 and 500 feet lengths which traverse it. These vehicles of trade grow longer and wider and deeper each succeeding year, and that our port may be equal to the demands made upon it it is imperative, in the judgment of the State board of harbor commissioners, that the Government afford the relief asked for and cut away this point 400 or 500 feet, widening the channel way to the westward and southward along the flats on the Portsmouth side to the North street wharves of the Seaboard Air Line in like proportion. Such cutting away would add immensely to the efficiency of this harbor, both as a harbor for commercial purposes and as a naval station, making it as to the latter—sufficient depth being given—the safest and most serviceable station on the Atlantic Seaboard.

The second point is the abutment of the old drawbridge, located, as stated, on the Eastern Branch. All along this Eastern Branch of the river is a continuous, solid wharfage front, extending from a point opposite Hospital Point eastward for about 2 miles on the Norfolk City side to the elevators and coal piers and freight and passenger station of the Norfolk and Western Railway, the railway property extending far above this abutment.

On the side (south) where the abutment is are located large sawmill properties. These wharf properties on both sides of the Eastern Branch are in constant use for purposes of trade and commerce, requiring vessels of heaviest capacity to handle the business. The abutment constricts the channel way, prevents the free entry and exit of the tide wave, as does Hospital Point, renders navigation difficult and to a degree hazardous, and has a tendency to estop the use of this portion of our harbor, thus forcing an unnecessary overcrowding at other portions.

The board is alive to the extent of the improvements which they are asking at the hands of the Government, but they nevertheless would respectfully urge it upon the attention of the Government, believing that, as in the past, so will it be with these improvements, every dollar expended will come back many times over to the people of the whole country in the shape of business which will add importance to the whole country.

In presenting this communication through you, and with the hope of receiving your approval and commendation, we desire it to be considered as a petition for

needed relief to one of our country's harbors, which, if granted, will result in adding to what nature has given us that which will render it second to none in point of usefulness to the Government and to the people of the country.

The state board of harbor commissioners would ask to be allowed to state that they recognize the absolute control of the General Government over the waters of this harbor through its duly authorized agent, the War Department, and to say that it is their purpose, acting under the authority of the State of Virginia, as she may have power to confer such authority, to be the guardian and protector of the integrity of the harbor, as the said duly authorized agent of the Government may establish it, as far as their authority may go to controlling the use of the harbor by those desiring to build upon its shores and use its waters, conforming in all they do or permit to the lines laid down by the Government and with the view of maintaining inviolate such lines and preserving such improvements as may be made from injury.

I have the honor to be, sir, very respectfully, your obedient servant,

W. R. MAYO,
President State Board of Harbor Commissioners.

The CHIEF OF ENGINEER CORPS, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
December 2, 1896.

Respectfully referred to Capt. Thos. L. Casey, Corps of Engineers, for remark.
To be returned through the division engineer.
By command of Brig. Gen. Craighill:

A. MACKENZIE,
Lieut. Col., Corps of Engineers.

[Second indorsement.]

U. S. ENGINEER OFFICE,
Norfolk, Va., December 12, 1896.

Respectfully returned to the Chief of Engineers, U. S. Army, through Col. Peter C. Hains, Corps of Engineers, Division Engineer, Southeast Division.

In my opinion the cutting off of 400 feet of the point known as Hospital Point in the harbor of Norfolk, with corresponding recast of the harbor lines, would prove of great and lasting benefit to the port. It could be done simultaneously with the regular project for deepening the harbor. In regard to the abutment of the old drawbridge, the Harbor Line Board convened recently in this city has already recommended its removal.

THOS. L. CASEY,
Captain, Corps of Engineers.

[Third indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 14, 1896.

Respectfully submitted to the Chief of Engineers, U. S. A.

I concur in the views of the district engineer. The toll-bridge abutment as far back as the bulkhead line, and a part of Hospital Point, should be cut off, but whether it is necessary to cut off so much as 400 feet of the latter may be a question. The channel width only a short distance above Hospital Point is now about 100 feet less than at the latter place.

To merely cut off 400 feet of Hospital Point, without any widening of the channel above, would not afford the needed relief.

I suggest that Captain Casey be requested to state precisely what he would propose to have done, both at Hospital Point and vicinity, his reasons for the same, and give an estimate of the cost. In this connection it is important to know the character of the material at Hospital Point that will have to be removed.

PETER C. HAINS,
Col., Corps of Engineers, U. S. A., Division Engineer, Southeast Division.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
December 23, 1896.

Respectfully returned to Captain Casey, inviting his attention to the preceding (third) indorsement, and with request that he furnish the information indicated by

Colonel Hains. In this connection attention is invited to report by Capt. G. J. Fiebeger, Corps of Engineers, dated February 26, 1890.

These papers will be returned through the division engineer.

By command of Brig. Gen. Craighill:

A. MACKENZIE,
Lieut. Col., Corps of Engineers.

[Fifth indorsement.]

U. S. ENGINEER OFFICE,
Norfolk, Va., January 8, 1897.

Respectfully returned to the Chief of Engineers, U. S. Army, through Col. Peter C. Hains, Corps of Engineers, Division Engineer, Southeast Division.

I have the honor to recommend a recast of the harbor lines in the vicinity of Hospital Point as shown on the accompanying tracing, where the proposed lines are drawn in red. The material at the point is generally rather hard, but alternates in strata as shown by the diagram of a boring taken at A. It is proposed to bulkhead the end of the shortened point and have landings made along the bulkhead, abolishing the projecting wharf which now exists. The project of course includes the removal of material above and below the point to correspond with the new harbor lines. The approximate cost of all excavation between the old lines and the new, as shown on the tracing, may be given as follows (including cost of inspection and contingencies), this being in reality an extension of the present approved project for 25 feet at low water to within 75 feet of the harbor lines, except at the point, where dredging is carried in over the 75-foot limit to a depth of 3 feet:

Material above low water, 65,000 yards at 15 cents	$9,750.00
Mud and sand (in place), 1,141,837 yards at 14 cents	159,857.18
Hard material, riprap, old piling, etc, 25,000 yards at 30 cents	7,500.00
Extending work to bulkhead line in front of hospital with 3 feet at low water, 9,666 yards at 15 cents	1,449.90
Rebuilding sea wall, 500 feet	10,000.00
Removing cemented sea wall	2,000.00
Removing non-cemented sea wall	600.00
Removing present wharf	300.00
Restoring landing, piling, etc	2,500.00
Total	193,957.08

It is intended that the present stone wall shall be used in constructing the new one.

THOS. L. CASEY,
Captain, Corps of Engineers.

[Sixth indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., January 4, 1897.

Respectfully returned to the district engineer. Please explain by a note on the map what the three red lines (viz, the dotted line, the full line, and the broken line) indicate.

PETER C. HAINS,
Col., Corps of Engineers, Division Engineer, Southeast Division.

[Seventh indorsement.]

U. S. ENGINEER OFFICE,
Norfolk, Va., January 15, 1897.

Respectfully returned to Colonel Hains, the explanations requested in the preceding indorsement having been noted on the map.

THOS. L. CASEY,
Captain, Corps of Engineers.

[Eighth indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., January 16, 1897.

Respectfully submitted to the Chief of Engineers and recommended for approval.

PETER C. HAINS,
Col., Corps of Engineers, Division Engineer, Southeast Division.

[Ninth indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
March 11, 1897.

Respectfully returned to Captain Casey inviting attention to the accompanying communication of the 5th instant from the Secretary of the Navy, in reference to the removal of the portion of Hospital Point.

It will be noted that the Navy Department estimates that it will cost $145,000 to build a new retaining wall, and $2,875.50 to replace the boathouse and wharf.

Inasmuch as it is understood from the project submitted by Captain Casey that he contemplates doing away with the wharf, and that he estimates that the rebuilding of the retaining wall will cost $10,000, it is suggested that he confer on the subject with the civil engineer of the Navy at the Norfolk Navy-Yard, and endeavor to reach a definite agreement as to what the changes in which the Navy Department is interested will cost.

By command of Brig. Gen. Wilson:

A. MACKENZIE,
Lieut. Col., Corps of Engineers.

[Tenth indorsement.]

U. S. ENGINEER OFFICE,
Norfolk, Va., May 7, 1897.

Respectfully returned to the Chief of Engineers, U. S. Army.

I have conferred with Civil Engineer P. C. Asserson, U. S. N., on the subject of a sea wall for Hospital Point after its curtailment, and can not agree with him as to the requirements of a sea wall at this particular place, which is simply a park, withdrawn entirely from nearly all commercial uses. A sea wall of sufficient strength to answer the purposes as defined in my report, will cost not far from $10,000, while that recommended by Mr. Asserson is such as would be built at a navy-yard, or mole, constantly called upon to answer the severest demands of commerce or of wave action. This is entirely unnecessary, and, if the project for this much-needed improvement of Norfolk Harbor were to be contingent upon the building of such a structure, the entire scheme would be rejected by Congress, and legitimately so.

THOS. L. CASEY,
Captain, Corps of Engineers.

(Through the Division Engineer.)

[Eleventh indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., May 10, 1897

Respectfully forwarded to the Chief of Engineers.

I do not know what the needs of the Navy Department are in respect to depth of water along the bulkhead line, but the Navy Department evidently contemplates the construction of a concrete wall with a considerable depth of water along the whole front of it, while Captain Casey estimates for a depth of only 3 feet.

I should suppose that the depth suggested by Captain Casey would be sufficient, as the place is used as a hospital and not for other naval purposes. In that case a suitable wall could, in my opinion, be built for the sum estimated by him.

A steamboat landing built on creosoted piles would perhaps be needed, extending out into, say 9 feet of water. Such a landing would cost more than the sum estimated by Captain Casey for a boat landing, but could be built for about $10,000, inclusive of a boathouse.

PETER C. HAINS,
Col., Corps of Engineers, Division Engineer, S. E. Division.

LETTER FROM THE SUPERINTENDENT AND SECRETARY OF THE NORFOLK AND PORTSMOUTH COTTON EXCHANGE.

NORFOLK AND PORTSMOUTH COTTON EXCHANGE,
Norfolk, Va., December 9, 1896.

DEAR SIR: At a meeting of the special committee appointed by the board of directors of the Norfolk and Portsmouth Cotton Exchange the following resolutions were unanimously adopted:

Whereas it has come to the knowledge of the Norfolk and Portsmouth Cotton Exchange that the State board of harbor commissioners has laid before the proper United States authorities a plan for certain improvements to this harbor, by widen-

ing of the same at Hospital Point and at the point up the Eastern Branch known as the old drawbridge abutment; and

Whereas said improvements have become within recent years a necessity to the handling of the greatly increased trade of this port, owing to the occupation of almost every point of land on the water front, and

Whereas the proposed improvements so necessary to commerce and to the needs of the United States Navy in obtaining easy access to and from the Norfolk Navy-Yard can be made now at small cost as compared to what it might cost if delayed until expensive improvements were erected upon a portion of those shallows now proposed to be cut away: Therefore,

Resolved, That the plan proposed by the State board of harbor commissioners is approved and strongly indorsed as eminently desirable not only for the present and future needs of the United States Navy, and the local commercial interests, but for the benefit to that great territory west and southwest, tributary to this port which would be beneficially affected by such improvement.

Resolved, That the necessity for prompt action be urged upon the proper United States authorities in control of such matters, and that copies of these resolutions be forwarded to the Secretary of the Navy, and the Chief of Engineers of the United States Army, and to the several Members of Congress from Virginia.

I am, dear sir, yours, very respectfully,

NORMAN BELL,
Superintendent and Secretary.

CHIEF OF ENGINEERS, U. S. A.,
In charge of Harbor Improvements.

LETTER FROM THE CHIEF OF ENGINEERS, UNITED STATES ARMY, TO THE HONORABLE THE SECRETARY OF WAR.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 15, 1897.

SIR: In connection with the further improvement of the harbor at Norfolk, Va., it has been suggested that a point of land known as Hospital Point should be removed for a distance of about 400 feet.

The land forms a part of the property now occupied as the site of a United States naval hospital, and I have the honor to recommend that inquiry be made of the Secretary of the Navy as to whether the land in question is owned by the United States and is under control of the Navy Department, and if so whether there would be any objection on the part of that Department to the proposed removal of about 400 feet of the point in widening the channel to Norfolk and the United States navy-yard at Portsmouth, Va.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

LETTER FROM THE HONORABLE THE SECRETARY OF WAR TO THE HONORABLE THE SECRETARY OF THE NAVY.

WAR DEPARTMENT,
Washington, D. C., February 17, 1897.

SIR: In connection with the further improvement of the harbor at Norfolk, Va., it has been suggested that a point of land known as Hospital Point should be removed for a distance of about 400 feet. The land forms a part of the property now occupied as the site of a United States naval hospital, and I beg therefore to inquire whether the land in question is owned by the United States and is under the control of your Department, and if so whether there would be any objection on the part of your Department to the proposed removal of about 400 feet of the point in widening the channel to Norfolk and the United States navy-yard at Portsmouth, Va.

Very respectfully,

DANIEL S. LAMONT, *Secretary of War.*

The SECRETARY OF THE NAVY.

LETTER FROM THE HONORABLE THE SECRETARY OF THE NAVY TO THE HONORABLE THE SECRETARY OF WAR, WITH ACCOMPANYING PAPERS.

NAVY DEPARTMENT,
Washington, D. C., March 5, 1897.

SIR: The Department is in receipt of your letter of the 17th ultimo, stating that in connection with the further improvement of the harbor at Norfolk, Va., it has been suggested that a point of land known as Hospital Point should be removed for a distance of 400 feet, and inquiring whether the land in question is owned by the United States and is under the control of this Department, and if so whether there would be any objection on the part of this Department to the proposed removal of about 400 feet of the point in widening the channel to Norfolk and the United States navy-yard at Portsmouth, Va.

In reply, I have to inform you that this property is owned by the United States and is under the control of this Department, and I send you herewith copies of the report made by the civil engineer at the Norfolk Navy-Yard, to whom your letter was referred, and also the report of the Bureau of Medicine and Surgery. From these reports you will see that the removal of this point of land will necessitate the building of a retaining wall, which, it is estimated, will cost $145,000, and the replacing of a boathouse and wharf, shown on the plan, which were erected last year at a cost of $2,875.50; that it will also necessitate the rearrangement of walks, roadways, etc., the estimated cost of which has not yet been determined.

If the removal of this point is deemed to be an engineering necessity and would contribute to the procurement of deep water, this Department would approve the scheme, presupposing, of course, that the Congress which should order the work would provide for the retaining wall required and the other changes necessitated by this work.

I have the honor to be, sir, very respectfully,

H. A. HERBERT, *Secretary.*

The SECRETARY OF WAR.

[Fifth indorsement.]

NAVY-YARD, NORFOLK, VA., *February 23, 1897.*

SIR: As directed by the third indorsement of the Bureau of Medicine and Surgery, dated the 19th instant, I herewith inclose blue print of the naval hospital lands, showing within red lines the point of land that would have to be removed to comply with the suggestions contained in letter file No. 7094, dated February 17, 1897, from the honorable Secretary of War.

The removal of this point of land would, in my judgment, not be detrimental to the adjoining hospital property, but would be a very great improvement to the Norfolk Harbor, and would make a much better fairway for the entrance to the navy-yard of our long and deep draft naval ships.

If this project is carried out it would be necessary to protect the remaining hospital land, from which the point would be removed, with a heavy concrete retaining wall about 540 feet long and 28 feet deep from coping level, the estimated cost of which is $145,000.

Very respectfully,

P. C. ASSERSON,
Civil Engineer, U. S. N.

Respectfully forwarded.

A. H. MCCORMICK,
Captain, U. S. N., Captain of the Yard.

The COMMANDANT, NAVY-YARD, *Norfolk, Va.*

[Seventh indorsement.]

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
February 26, 1897.

Respectfully returned to the Department, inviting attention to the fifth indorsement and accompanying blue prints.

The advantages of the proposed plan are obvious, and meet with the Bureau's full approval if funds are available or will be provided for the retaining wall ($145,000) and for replacing the boathouse and wharf shown on the plan, which were erected last year at a cost of $2,875.50. The changes proposed will also necessitate a rearrangement of walks, roadways, etc.; estimated cost yet to be determined.

J. R. TRYON,
Surgeon-General, U. S. N.

LETTER FROM THE HONORABLE THE SECRETARY OF THE NAVY TO THE HONORABLE THE SECRETARY OF WAR, WITH LETTERS AND INDORSEMENTS REFERRED TO.

NAVY DEPARTMENT,
Washington, March 30, 1897.

SIR: Referring to this Department's letter of the 5th instant, relative to the proposed removal of a point of land, under the control of this Department, known as Hospital Point, in connection with the contemplated harbor improvements at Norfolk, Va., I have the honor to inclose herewith, for your information and such action as you may deem proper, copies of certain correspondence between Civil Engineer P. C. Asserson, U. S. N., of the Norfolk Navy-Yard, and Capt. Thos. L. Casey, of the Corps of Engineers, U. S. A., relative to the proposed improvement and the character and cost of the changes necessitated thereby to the property of the Navy Department.

In view of the statements contained in the letter of Civil Engineer Asserson, dated March 23, 1897, and the indorsement thereon of the Surgeon-General of the Navy, the Department begs to renew the suggestions contained in the closing paragraph of its letter of the 5th instant, above referred to, relative to securing from Congress an appropriation sufficient to provide for a retaining wall of the character recommended by the civil engineer and the other changes necessitated by the contemplated improvements. The suggestions therein made were as follows:

"If the removal of the point is deemed to be an engineering necessity and would contribute to the procurement of deep water, this Department would approve the scheme, presupposing, of course, that the Congress which would order the work would provide for the retaining wall required and the other changes necessitated by this work."

I have the honor to be, sir, very respectfully,

JOHN D. LONG, *Secretary.*

The SECRETARY OF WAR.

[Second indorsement.]

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
March 26, 1897.

Respectfully referred to the Department for its information and action.

The Bureau's indorsement of February 26, 1897, relative to contemplated improvements, is adhered to; and which is as follows, viz:

"The advantages of the proposed plan are obvious, and meet with the Bureau's full approval if funds are available or will be provided for the retaining wall ($145,000) and for replacing the boathouse and wharf shown on the plan, which were erected last year at a cost of $2,875.50. The changes proposed will also necessitate a rearrangement of walks, roadways, etc.; estimated cost yet to be determined."

J. R. TRYON,
Surgeon-General, U. S. Navy.

NAVY-YARD, NORFOLK, VA., *March 24, 1897.*

SIR: The War Department having directed Capt. Thomas L. Casey, U. S. A., to confer with me in relation to the proposed shortening of Hospital Point, I herewith forward for the information of the Surgeon-General copies of two letters on the subject which will explain themselves.

Very respectfully,

P. C. ASSERSON,
Civil Engineer, U. S. Navy.

Respectfully forwarded.

W. W. MEAD,
Commander, U. S. N., Acting Captain of the Yard.

The COMMANDANT,
Navy-Yard, Norfolk, Va.

U. S. ENGINEER OFFICE,
Norfolk, Va., March 19, 1897.

MY DEAR SIR: I regret that an engagement prevented me from seeing you while in town the other day, and had I known of your intended visit earlier could have arranged otherwise.

In regard to the matter of revetting the shore line of the abbreviated Hospital Point, which seems to be the subject-matter of the difference between us, I have only to say that we are apparently considering quite different objects. In my report upon

the subject I inserted an item of $10,000 for replacing the material forming the present sea wall along the shore line of the shortened point, placing the footing at no greater depth than that of the present sea wall. At the same time, I proposed to abolish the wharf altogether, and have landings made along the bulkhead, which could be dredged a little more at that point and piled along the revetment. I believe my estimate is a reasonable one for the object proposed. I gather, from the documents submitted to me, that you have in view the formation of a very deep and expensive concrete sea wall, which, in my opinion, the circumstances do not entirely warrant. I feel sure that if an item of $145,000 for a sea wall is inserted in the project for improving the harbor at Hospital Point, the entire project will be killed, and this improvement, so desirable for the commercial interests of the port, rendered entirely impossible. It would be better, it seems to me, to adhere to the plans and estimate which I submitted recently, and then, after the thing is an accomplished fact, ask Congress for a separate appropriation for any kind of a sea wall that you may deem desirable.

Hoping to hear from you at your convenience, I am,

Very respectfully,

THOS. L. CASEY,
Captain, Corps of Engineers.

Mr. P. C. ASSERSON,
Civil Engineer, U. S. Navy, Navy-Yard, Norfolk, Va.

NAVY-YARD, NORFOLK, VA., *March 23, 1897.*

SIR: In reply to your letter of the 19th instant, I would state that I had supposed that the only object for the removal of Hospital Point would be to widen the deep water channel so that long ships of deep draft could have room to turn around without entirely blocking the channel, and that the line 450 feet back from the present Hospital Point would become the new port warden's line with deep water up to it; this in my judgment is necessary if the proposed improvement is to be of any practical value to the fast increasing commerce that seeks outlet from this harbor in long and deep-draft ships. With that object in view, I had estimated for a concrete retaining wall of proper size and depth to meet the requirements. From experience I know that the substratum of the land at this point is underlaid with very soft material—either quicksand or very soft silt—as we have failed to obtain satisfactory bearing power for an ordinary light wharf with piles 65 feet long. If, therefore, this point of land is cut off by dredging, there would be nothing to prevent the land for a very long distance beyond the point dredged to slide into the channel and form a long shallow beach in front of the point, the same as is now observed on both sides of Hospital Point, where we want a deep-water channel.

The present light sea wall around Hospital Point, which only extends to the low-water line, and which you propose to replace across the shortened point, has always been found insufficient to retain the land behind it, even with a long shallow beach in front of it, for repairs to this wall with refilling behind it has been one of nearly annual occurrence. I can not, therefore, agree with you in recommending the construction of a light, shallow, and, in my judgment, wholly inadequate sea wall to protect the shortened point, for I feel certain that it would rapidly find its way, along with much of the land behind it, into the river as soon as the dredging should be completed.

I agree with you that the wharf at this point should be abolished. I think, also, that we should have sufficient depth of water along the sea wall to take a deep-draft ship up to it.

I am firmly of the opinion that the Department and Congress should be fully advised as to the cost of any permanent proposed improvement, when it is possible, before the work is commenced.

To ask the Department or Congress for additional appropriations after they had reason to suppose the work completed, I think bad policy.

Very respectfully,

P. C. ASSERSON,
Civil Engineer, U. S. N.

Capt. THOS. L. CASEY,
Corps of Engineers.

All the maps referred to in the above correspondence have been omitted excepting the tracing alluded to in the fifth indorsement on the letter of the president of the State board of harbor commissioners, a copy of which is submitted. This shows all information necessary to

a perfect understanding of what is desired. The improvement suggested seems to be warranted by the commercial interests of the harbor and the fact that the major portion of its traffic passes near the point in question, rendering it the busiest part of the harbor and consequently a locality where the greatest width of channel should exist.

Norfolk Harbor is in the collection district of Norfolk and Portsmouth, and Norfolk, Va., is the nearest port of entry. Nearest light-house is Craney Island light at mouth of Elizabeth River, Virginia. Nearest fort, Fort Monroe, Va.

Amount of revenue collected at the port of Norfolk, Va., during the fiscal year ended June 30, 1897, $24,293.75.

Money statement.

July 1, 1896, balance unexpended	$100,758.67
June 30, 1897, amount expended during fiscal year	92,595.43
July 1, 1897, balance unexpended	8,163.24
July 1, 1897, outstanding liabilities	370.00
July 1, 1897, balance available	7,793.24
Amount (estimated) required for completion of existing project	56,774.56
Amount that can be profitably expended in fiscal year ending June 30, 1899	56,776.56
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

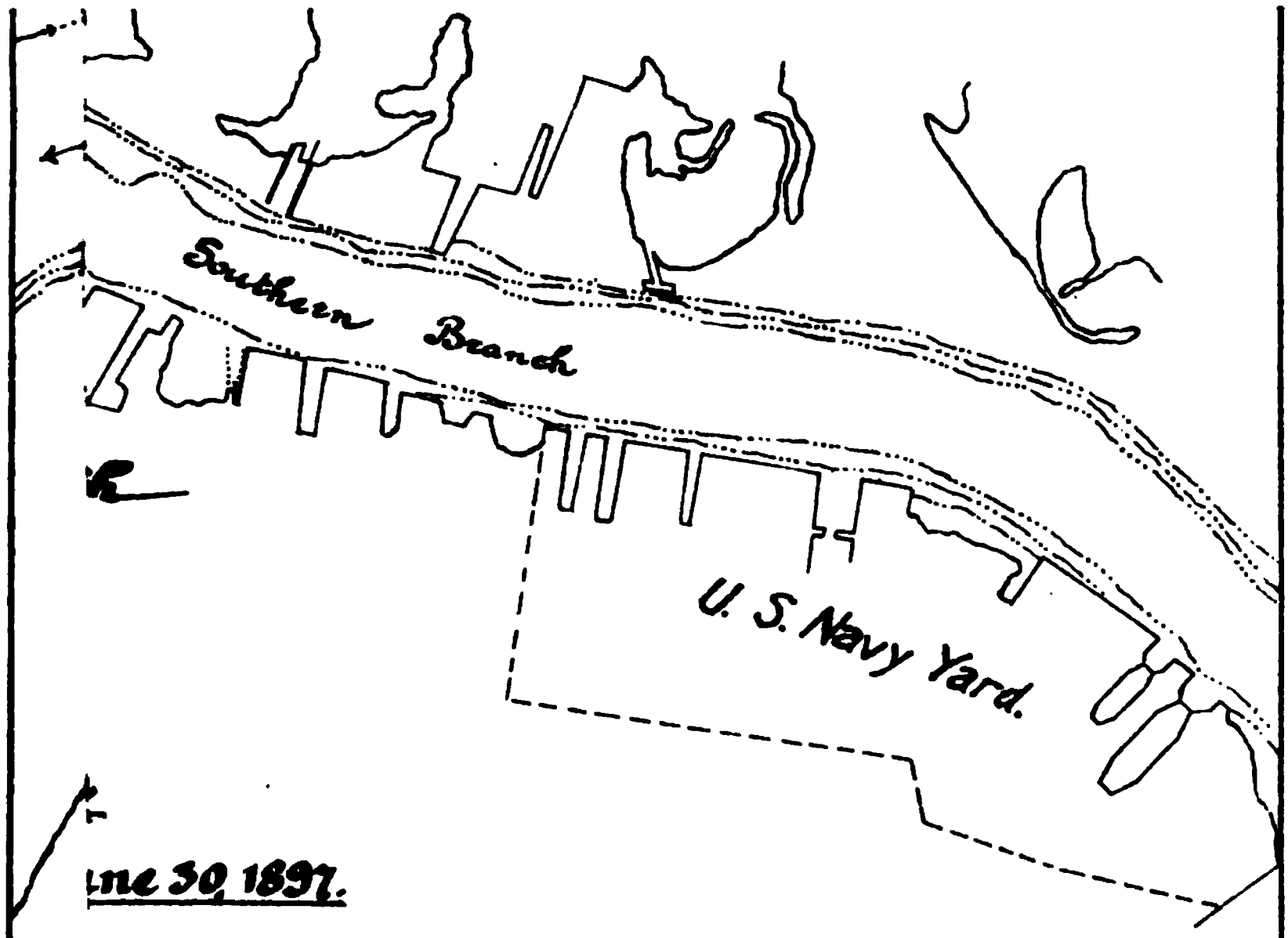
August 14, 1876	$35,000	August 11, 1888	$50,000
June 18, 1878	50,000	September 19, 1890	150,000
March 3, 1879	75,000	July 13, 1892	150,000
June 14, 1880	50,000	August 17, 1894	100,000
March 3, 1881	75,000	June 3, 1896	100,000
August 2, 1882	75,000		
July 5, 1884	25,000	Total	985,000
August 5, 1886	50,000		

Abstract of bids for dredging harbor at Norfolk, and its approaches, Virginia, received in response to advertisement dated August 13, 1896, and under specifications of the same date, and opened by Capt. Thomas L. Casey, Corps of Engineers, September 28, 1896.

No.	Name and address of bidder.	Amount bid per cubic yard.	Amount that can be removed at price bid with available funds.	Daily amount to be excavated.	Time to commence (after notification).	Time to complete.
		Cents.	*Cu. yds.*	*Cu. yds.*	*Days.*	*Mos.*
1	Virginia Dredging Co., Richmond, Va.	$10\frac{8}{10}$	810,185	2,000	30	10
2	Elijah Brainard, New York, N. Y.	$9\frac{9}{10}$	883,838	5,500	10	10
3	Sanford & Brooks, Baltimore, Md.	$9\frac{9}{10}$	883,838	4,000	30	10
4	P. Sanford Ross, Jersey City, N. J.	$9\frac{7}{10}$	902,062	3,500	30	10
a 5	Morris & Cumings Dredging Co., New York, N. Y.	$8\frac{1}{4}$	1,000,000	2,000	20	10
6	Chester T. Caler, Norfolk, Va.	$13\frac{1}{8}$	648,148	2,500	(b)	(c)
7	Baltimore Dredging Co., Baltimore, Md.	10	875,000	3,000	10	10
8	Rittenhouse R. Moore, Mobile, Ala.	$10\frac{9}{10}$	802,752	d 3,000	60	10
9	American Dredging Co., Philadelphia, Pa.	$10\frac{9}{10}$	857,843	4,000	20	10

a Lowest bid. Contract entered into October 7, 1897.
b About April 15, 1897.
c About April 15, 1898.
d Or more.

Amount available for dredging under contract, $87,500.



ine 30 1897.

U.S. Engineer Office.
Norfolk, Va July 16. 1897.
To accompany Annual Report for 1897.

Thos Casey
Captain, Corps of Engineers U.S.A.

Contract in force.

Name and address of contractor, Morris & Cumings Dredging Company, New York, N. Y.; date of approval, October 20, 1896; date of beginning work, October 20, 1896; date of expiration, May 8, 1897.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the harbor at Norfolk, Va., during the calendar year 1896 were compiled from statements furnished by parties making shipments over this waterway:

Articles.	Amount.	Value.
	Tons.	
Coal	1,770,404	$4,074,402
Cotton	86,175	12,064,430
Lumber	607,046	6,070,460
Fertilizer	30,395	404,800
Ice	33,810	71,950
Miscellaneous	3,458,806	148,461,561
Total	5,980,636	171,147,603

Vessels.	Number.	Average draft.	Average tonnage.
		Feet.	*Tons.*
Steam	3,631	15	1,672
Sail	1,424	13	585
Barges	10,816	9	622
Lighters	411	3	41
Rafts	316	.....	.....
Total	16,598	.....	.....

NEW LINE OF TRANSPORTATION.

Established July 7, 1896, by the Baltimore, Chesapeake and Richmond Steamboat Company, between Norfolk, Va., and Baltimore, Md., daily service except Sunday from each point.

Approximate amount of freight of all kinds shipped and received by water.

Year.	Tons.	Year.	Tons.
1888	1,914,506	1893	3,584,727
1889	2,243,087	1894	4,545,049
1890	2,384,841	1895	5,013,185
1891	2,931,751	1896	5,986,636
1892	3,427,189		

K 2.

IMPROVEMENT OF WESTERN BRANCH OF ELIZABETH RIVER, VIRGINIA.

The project submitted for the expenditure of the appropriation of $45,000 in the act of June 3, 1896, for completing the improvement of this stream, was approved September 2, 1896. This project has in view the dredging of a channel 200 feet wide and 20 feet deep at mean low water from the 20-foot contour in Norfolk Harbor, Virginia, for a distance of about 1 mile.

The work was advertised under date of September 9, 1896, and the proposals received in response to the advertisement were opened October 26, 1896 (abstract appended). The contract for doing the necessary dredging was awarded to the lowest bidder, P. Sanford Ross, of Jersey

City, N. J., at 8.4 cents per cubic yard, measured in scows. The contract was signed on November 7, 1896.

At the close of the fiscal year the contractor's plant, consisting of one clam-shell dredge, two tugboats, and six scows, which commenced work under the contract on December 14, 1896, was still employed in dredging the channel. During the fiscal year this plant removed 378,037 cubic yards of material, scow measurement, giving a channel from the 20-foot contour in Norfolk Harbor, Virginia, 3,400 feet long, 200 feet wide, and 160 feet in width for a farther distance of 1,450 feet, a depth of 20 feet at mean low water being obtained throughout. The dredged material was principally mud, mixed with sand and oyster shells, and was all deposited from scows back of the ripraps in Hampton Roads.

While sufficient time has not elapsed since the channel at the mouth of the river was dredged to allow a definite opinion to be formed from cross-current observations made at this part of the river, it is anticipated that gradual filling will take place in the dredged cut. Until the extent of filling and the distance over which it occurs can be ascertained, it will not be practicable to decide upon a plan for obviating this shoaling.

The funds appropriated in the act of June 3, 1896, will be sufficient to complete the channel as projected and the work will probably be finished in July, 1897.

This river is in the collection district of Norfolk and Portsmouth, Va., and Norfolk, Va., is the nearest port of entry. Nearest light-house, Craney Island Light, at the mouth of Elizabeth River, Virginia. Nearest fort, Fort Monroe, Va.

The amount of revenue collected at the port of Norfolk, Va., during the fiscal year ended June 30, 1897, is $24,293.75.

Money statement.

July 1, 1896, balance unexpended		$45,000.00
June 30, 1897, amount expended during fiscal year		27,752.50
July 1, 1897, balance unexpended		17,247.50
July 1, 1897, outstanding liabilities	$4,561.14	
July 1, 1897, amount covered by uncompleted contracts	11,449.02	
		16,010.16
July 1, 1897, balance available		1,237.34

APPROPRIATIONS.

June 3, 1896	$45,000.00

Abstract of bids for dredging Western Branch of Elizabeth River, Virginia, received in response to advertisement dated September 9, 1896, and under specifications of the same date, and opened by Capt. Thomas L. Casey, Corps of Engineers, October 26, 1896.

No.	Name and address of bidder.	Amount bid per cubic yard.	Amount that can be removed at price bid with available funds.	Daily amount to be excavated.	Time to—	
					Commence (days after notification).	Complete (months).
		Cents.	*Cu. yards.*	*Cu. yds.*		
1	Virginia Dredging Co., Richmond, Va.	$8\frac{7}{10}$	465,517	3,000	30	5
2	Elijah Brainard, New York, N. Y.	$8\frac{1}{4}$	462,857	2,000	30	5
3	American Dredging Co., Philadelphia, Pa.	$9\frac{3}{10}$	440,217	2,000	30	5
4	Sanford & Brooks, Baltimore, Md.	$9\frac{1}{10}$	445,055	4,000	40	5
5	Rittenhouse R. Moore, Mobile, Ala.	10	405,000	2,500	30	5
6	P. Sanford Ross, Jersey City, N. J. *a*	$8\frac{4}{10}$	482,143	3,000	30	5
7	Chester T. Caler, Norfolk, Va.	$9\frac{1}{8}$	410,127	2,000	60	5

a Lowest bid.

Amount available from appropriation of June 3, 1896, for improving Elizabeth River, Virginia, $40,500.

Contract in force.

Name and residence of contractor.	Date of approval of contract.	Date of beginning work.	Date of expiration.
P. Sanford Ross, 277 Washington street, Jersey City, N. J..	Nov. 12, 1896	Dec. 14, 1896	May 1, 1897 *a*

a Extended to August 1, 1897.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the Western Branch of the Elizabeth River, Virginia, during the calendar year 1896, were kindly furnished by Mr. Charles O. Haines, superintendent and chief engineer of the Atlantic and Danville Railroad:

Articles.	Amount.	Value.
	Tons.	
Coal	750	$3,600
Guano	300	4,800
Forest products	199,492	18,742,619
Miscellaneous	11,111	3,333,300
Total	211,653	22,084,319

Vessels.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	4	11	187
Sail	296	12	325
Barges	1,506	5	675
Lighters	80	2	6
Total	1,886	.....	.....

IMPROVEMENT OF NANSEMOND RIVER, VIRGINIA.

The act of June 3, 1896, contained an item of $5,000 for continuing work on this improvement.

The amount of the appropriation being small, it was recommended in the project submitted June 24, 1896, that it be held back until sufficient funds were available to warrant operations having in view the completion of the adopted project, unless it became evident that the immediate relief of navigation demanded the expenditure of the appropriation. This project was approved July 1, 1896.

The only work done during the fiscal year was the removal of five small and three large trees from the channel of the river 3 miles below Suffolk, Va., of which complaint was made by the owners of vessels navigating the river. This work was done by the snag boat *Roanoke* March 20 to 23, 1897, inclusive, and cost $77.50.

A sunken mud scow in the river above the bridge at Suffolk, Va., was the subject of another complaint, but after the owners of the scow had been given notice of the obstruction, they removed it.

Nansemond River is in the collection district of Norfolk and Portsmouth and Norfolk, Va., is the nearest port of entry. Nearest light-house, Pig Point Light, at mouth of river. Nearest fort, Fort Monroe, Va.

The amount of revenue collected at the port of Norfolk, Va., during the fiscal year ended June 30, 1897, is $24,293.75.

Money statement.

July 1, 1896, balance unexpended	$5,000.00
June 30, 1897, amount expended during fiscal year	82.87
July 1, 1897, balance unexpended	4,917.13
Amount (estimated) required for completion of existing project	107,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	30,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1873	$15,000	September 19, 1890	$10,000
March 23, 1874	10,000	July 13, 1892	10,000
March 3, 1875	5,000	August 17, 1894	10,000
March 14, 1876	5,000	June 3, 1896	5,000
June 18, 1878	2,000		
August 11, 1888	10,000	Total	82,000

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the Nansemond River, Virginia, during the calender year 1896 were compiled from statements furnished by parties making shipments by way of this stream:

Articles.	Amount.	Value.
	Tons.	
Coal	2,016	$10,806
Ice	4,500	5,715
Lumber	43,149	221,354
Miscellaneous	11,540	1,777,160
Lime	200	1,800
Total	61,405	2,016,835

Vessels.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	7	9	357
Sail	191	11	205
Barges	1	14	.....
Total	199	.....	.....

Approximate amount of freight of all kinds received and shipped by water.

Year.	Tons.	Year.	Tons.
1888	109,900	1893	59,473
1890	217,738	1894	53,762
1891	78,572	1895	59,701
1892	133,723	1896	61,405

K 4.

IMPROVEMENT OF APPOMATTOX RIVER, VIRGINIA.

No work has been done on this improvement during the fiscal year. The project submitted June 24, 1896, and approved July 1, 1896, for the expenditure of $5,000 appropriated by act of June 3, 1896, provided for the retention of the amount until it became evident that dredging of shoals formed by freshets was necessary for the free navigation of the river.

The expenditures during the fiscal year have been for care of plant.

This work is in the collection district of Petersburg, Va., which is the nearest port of entry. Nearest light-house, Jordan Point Light, in the James River, Virginia. Nearest fort, Fort Monroe, Va.

No revenue was collected at the port of Petersburg, Va., during the fiscal year ended June 30, 1897.

Money statement.

July 1, 1896, balance unexpended	$5,120.13
June 30, 1897, amount expended during fiscal year	529.47
July 1, 1897, balance unexpended	4,590.66
July 1, 1897, outstanding liabilities	40.00
July 1, 1897, balance available	4,550.66
Amount (estimated) required for completion of existing project	48,090.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	30,000.00
For maintenance and repair during fiscal year ending June 30, 1899	10,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

March 3, 1871	$50,000	August 2, 1882	$33,000
June 10, 1872	40,000	July 5, 1884	25,000
March 3, 1873	30,000	August 5, 1886	18,750
June 23, 1874	30,000	August 11, 1888	15,000
March 3, 1875	30,000	September 19, 1890	15,000
August 14, 1876	30,000	July 13, 1892	15,080
June 18, 1878	30,000	August 17, 1894	5,000
March 3, 1879	20,000	June 3, 1896	5,000
June 14, 1880	20,000		
March 3, 1881	20,000	Total	433,830

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the Appomattox River, Virginia, during the calendar year 1896 were furnished by Mr. W. H. Mays, harbor master, Petersburg, Va.:

Articles.	Amount.	Value.
	Tons.	
General merchandise	44,027	$270,136
Fertilizers	7,848	79,470
Coal	6,855	39,694
Peanuts	836	89,902
Lumber	22,252	11,126
Total	81,318	490,328

Vessels.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	890	6.5	170
Sail	347	8.5	140
Barges	76	9	288
Total	1,313	.....	.....

Approximate amount of freight of all kinds received and shipped by water.

Year.	Tons.	Year.	Tons.
1888	30,626	1891	26,275
1889	26,121	1892	25,218
1890	21,693	1896	81,318

K 5.

IMPROVEMENT OF HARBOR AT CAPE CHARLES CITY, VIRGINIA.

[This work was in charge of Mr. William F. Smith, United States agent, Major, Corps of Engineers (retired), until April 26, 1897.]

The proviso in the act of July 13, 1892, requiring the owners of the basin forming the harbor to execute and file with the Secretary of War an instrument in writing granting to any and all vessels the right to enter the harbor, upon any and all occasions for all time to come, without charge, and to dedicate an approach to said harbor by the nearest public highway before any Government money should be expended in its improvement, was repealed by the act of June 3, 1896, and projects were accordingly submitted on October 8 and 9, 1896, respectively, for the expenditure of the appropriation of $10,000 in the act of July 13, 1892, and the balance of the former appropriation in dredging and in the construction of about 400 linear feet of the projected jetty on the north side of the channel entering the basin. The projects had in contemplation the expenditure of $3,000 for dredging and $8,000 for jetty construction, and both were approved as submitted, the work in each instance to be done by contract after public advertisement.

Proposals for dredging were opened December 1, 1896 (abstract appended). The contract was awarded to the lowest bidders, Sanford & Brooks, of Baltimore, Md., at 13.9 cents per cubic yard, measured in place. The work of dredging under the contract, which was entered into with the above-named firm December 10, 1896, was commenced December 23, 1896, and completed January 26, 1897. During this period 14,457 cubic yards of material, place measurement, was excavated and deposited inshore above Plantation Creek, the result being a channel 1,600 feet long, 70 feet wide, and 16 feet deep at mean low water, extending from a point opposite the west side of the "Barrel House" westward to deep water in the Cherrystone Inlet channel.

The dredging described above was rendered necessary by the filling in of the channel between the points indicated, which channel had contracted in width and shoaled in depth at places to 12 feet at mean low water. This channel was dredged in 1891 to 16 feet at mean low water.

Before specifications for the construction of the jetty on the north side of the channel could be prepared, 6 equidistant borings were taken between the shore line at Mason avenue and the Cherrystone Inlet channel to determine the nature of the bottom. This was found to be, for the most part, too soft to permit the construction of the jetty without a brush-mattress foundation.

Specifications were then prepared under date of November 25, 1896, and proposals invited by advertisement of same date for constructing the jetty, which was to extend as far out from the shore line at end of

Mason avenue as the funds available ($8,000) for the work would permit. Proposals were opened December 28, 1896, the lowest bid being that of John Keller & Son, of Lancaster, Pa., at $1.40 per cubic yard for brush mattress in place and $2.55 per cubic yard for stone in place. A contract was entered into with this firm under date of January 7, 1897.

Previous to the commencement of work of jetty construction under the contract, the New York, Philadelphia and Norfolk Railroad Company offered to construct 750 feet of the jetty on the line projected and in a manner satisfactory to the Government. This offer being reported to the Department was duly accepted. The portion of the jetty to be constructed by the railroad company was completed in March, 1897.

Work on the portion to be built by the Government under contract with Messrs. Keller & Son began on March 9, 1897. On May 21, 1897, 400 feet had been added to that built by the railroad, exhausting the funds. The total length of the jetty is now 1,150 feet.

The part of the jetty completed is 4 feet in width on top, has a slope of 2 on 1 on both sides, is built up to 3 feet above mean high water, and extends from fast land outward to a depth of 5.3 feet at mean low water. Except the 750 feet built by the railroad company, which was constructed of oyster shells and faced with heavy stone, the jetty was constructed in the following manner: Four layers of brush mattress 4 inches thick, compressed to 15 inches in sections 35 feet in width and 48 feet in length, were sunk in position between piles spaced 50 feet apart driven to mark the axial line of the jetty, as a foundation for the stone. Upon this brush-mattress foundation stone, weighing from 25 to 300 pounds, was placed to form the inner core and this faced with stone of from 500 to 1,000 pounds in weight. The stone required was delivered by rail. The cars were run out on a temporary track built over the line of the jetty and the stone unloaded from them and placed by a small derrick mounted on a flat car.

The material required to construct the 400 linear feet of the jetty built under contract by the Government was 722.23 cubic yards (measured in place) of brush mattress and 2,647.68 cubic yards of stone, also measured in place. The contract price was $1.40 and $2.55 per cubic yard, respectively, measured in place, and the total cost of the 400 feet constructed was $7,762.70.

The approved project for this improvement contemplates the construction of jetties of rubblestone, with heavy stone facing on both the north and south sides of the channel to prevent the agitation of the water and the deposition of sand in the channel during stormy weather. The jetty on the north side now lacks 450 feet of its projected length. The construction of the jetty on the south side has not been commenced. To prevent the filling in of the channel, and in order to facilitate its navigation by the tows of heavy car barges and steamers in stormy and thick weather, it is deemed advisable to complete the jetties as soon as possible, otherwise it will be necessary to dredge the entrance channel from time to time in order to maintain it in a navigable condition. The cost of this, including a small amount of dredging now necessary in the channel in the bay, will be about $40,000.

Cape Charles City Harbor is in the collection district of Cherrystone, Va., and Cape Charles City, Va., is the nearest port of entry. Fort Monroe, Va., is the nearest fort, and the nearest light-house is Cherrystone Light.

No revenue was collected at the port of Cape Charles City, Va., during the fiscal year ended June 30, 1897.

Money statement.

July 1, 1896, balance unexpended	$11,579.07
June 30, 1897, amount expended during fiscal year	11,486.53
July 1, 1897, balance unexpended	92.54
July 1, 1897, outstanding liabilities	75.00
July 1, 1897, balance available	17.54
Amount (estimated) required for completion of existing project	107,340.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	40,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

By act approved—	
September 19, 1890	$25,000
July 13, 1892	10,000
Total	35,000

Abstract of proposals for dredging in harbor of Cape Charles City, Va., received by Gen. William F. Smith, United States agent, and opened December 1, 1896.

No.	Name and address of bidder.	Time to—		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	Sanford & Brooks, Baltimore, Md. *a*	Dec. 10, 1896	Jan. 15, 1897	13.9
2	Chester T. Caler, Norfolk, Va	Jan. 5, 1897	Mar. 15, 1897	19.5
3	Morris & Cumings Dredging Co., New York, N. Y	15 days	40 days	16.7
4	Baltimore Dredging Co., Baltimore, Md	30 days	60 days	25

a Lowest; contract entered into December 10, 1896.

Amount available, $3,000.

Abstract of proposals for construction of brush and stone jetty in harbor of Cape Charles City, Va., received by Gen. William F. Smith, United States agent, and opened December 28, 1896.

No.	Name and address of bidder.	844½ cubic yards mattress, in place, and 2,421 cubic yards stone, in place.					Time to—	
		Mattress.		Stone.		Grand total.	Commence.	Complete.
		Per cubic yard.	Total.	Per cubic yard.	Total.			
1	B. F. Sweeten & Son, Camden, N. J	$1.53	$1,292.09	$4.03	$9,756.63	$11,048.72	1897. Feb. 1	1897. May 1
2	Asa B. Cook, Petersburg, Va	2.43	2,052.14	2.43	5,883.03	7,935.17	Mar. 1	July 1
3	Sanford & Brooks, Baltimore, Md	1.25	1,055.63	2.90	7,020.90	8,076.53	...do	July 30
4	John L. Grim, Philadelphia, Pa.	2.20	1,857.90	3.10	7,505.10	9,363.00	Apr. 1	Aug. 1
5	John Keller & Son, Lancaster, Pa. *a*	1.40	1,182.30	2.55	6,173.55	7,355.85	Jan. 15	June 1

a Lowest, recommended. Contract entered into January 7, 1897.

List of all contracts in force.

Name and address of contractors.	Date of approval.	Date of beginning work.	Date of expiration.
Sanford & Brooks, Baltimore, Md	Dec. 19, 1896	Dec. 23, 1896	Jan. 26, 1897
John Keller & Son, Lancaster, Pa	Jan. 27, 1897	Mar. 9, 1897	May 21, 1897

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the harbor at Cape Charles City, Va., during the calendar year 1896, were kindly furnished by Mr. R. H. Nicholas, superintendent of the New York, Philadelphia and Norfolk Railroad Company:

Articles.	Amount.	Value.
	Tons.	
Cotton	14,419	$288,380
Fruit and vegetables	60,036	3,001,800
Lumber	270,893	2,708,930
Merchandise	29,162	1,458,100
Mill products	8,349	250,470
Miscellaneous	104,145	5,207,250
Total	487,004	12,914,930

Vessels.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	730	7.5	750
Sail	343	5	1,100
Barges	468	9	1,200
Total	1,541	.....	.....

Approximate amount of freight of all kinds shipped and received by water.

Year.	Tons.	Year.	Tons.
1890	390,207	1894	427,723
1891	319,164	1895	455,269
1892	341,269	1896	487,004
1893	393,352		

K 6.

IMPROVEMENT OF NANDUA CREEK, VIRGINIA.

This is a new work, for which an appropriation of $3,000 was made in the act of June 3, 1896. A project for the expenditure of the funds appropriated was submitted June 24, 1896. At the close of the fiscal year no action had been taken on the project, consequently no work has been attempted. The fund is so small that it can not be expended advantageously in view of the probably unusual cost of dredging in this exposed locality.

Nandua Creek is in the collection district of Cherrystone, Va., and Cape Charles City, Va., is the nearest port of entry. Fort Monroe, Va., is the nearest fort, and the nearest light-house is Cherrystone Light.

No revenue was collected in the collection district of Cherrystone, Va., during the fiscal year ended June 30, 1897.

Money statement.

July 1, 1896, balance unexpended	$3,000.00
July 1, 1897, balance unexpended	3,000.00
Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts for 1866 and 1867.	3,000.00

APPROPRIATION.

June 3, 1896 ..... $3,000

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of Nandua Creek, Virginia, during the calendar year 1896, were furnished by Mr. Willard Thompson, general manager of the Baltimore, Chesapeake and Atlantic Railroad Company:

Articles.	Amount.	Value.
	Tons.	
Produce	3,700	$53,000
Oysters	600	9,000
Fertilizer	500	15,000
Miscellaneous	1,325	35,940
Total	6,125	112,940

No information as to the vessels handling the commerce of the creek could be obtained.

K 7.

IMPROVEMENT OF INLAND WATER ROUTE FROM NORFOLK, VIRGINIA, TO ALBEMARLE SOUND, NORTH CAROLINA, THROUGH CURRITUCK SOUND.

Actual operations on this improvement have been confined to the removal of sunken logs from the channels serving as approaches to the Albemarle and Chesapeake Canal. The work was done by hired labor with the snag boat *Roanoke.*

During the fiscal year the snag boat was employed on the route for a period of one hundred and ten days, including Sundays and legal holidays, removing 687 logs, 3 trees, 2 stumps, and 1 long pile from the North Landing River, Virginia and North Carolina, between Pungo Ferry and the Albemarle and Chesapeake Canal at North Landing, Virginia, and 51 logs from North River, North Carolina, in the vicinity of Beacon No. 9.

The project for the expenditure of the appropriation of $10,000 in the act of June 3, 1896, submitted on June 24, 1896, provided for dredging the channel in Coanjock Bay, retaining $2,000 of that amount for removal of sunken logs by hired labor, the dredging, however, to be done by contract, after advertisement. This was modified, upon urgent request of the navigation interests concerned, so as to permit the amount reserved for dredging ($7,000) to be expended in widening and deepening the channel between the Canal locks and Nicuargua Bar, in the southern branch of the Elizabeth River, Virginia, the present channel being too devious and narrow to allow navigation of it by long tows without danger of grounding and consequent loss of time.

Specifications were accordingly issued under date of May 11, 1897, and proposals were opened June 22, 1897 (abstract appended), after advertisement in accordance with law and regulations. The lowest bid received was that of Chester T. Caler, of Norfolk, Va., at 23 and 33 cents per cubic yard for material dumped from scows and placed on shore, respectively, scow measurement, with whom a contract will be entered into to perform the work.

This work is in the collection districts of Norfolk and Portsmouth, Va., and Albemarle, N. C., and Norfolk, Va., and Edenton, N. C., are the nearest ports of entry. Nearest light-house, Long Point Light, in Coanjock Bay, North Carolina. Fort Monroe, Va., is the nearest fort.

The amount of revenue collected at the ports of Norfolk, Va., and Edenton, N. C., during the fiscal year ended June 30, 1897, is $24,293.75 and $15, respectively.

Money statement.

July 1, 1896, balance unexpended	$10,836.04
June 30, 1897, amount expended during fiscal year	1,948.61
July 1, 1897, balance unexpended	8,887.43
Amount (estimated) required for completion of existing project	29,667.08
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

For Southern Branch, Elizabeth River, Virginia—	
March 3, 1873	$15,000
June 23, 1874	10,000
March 3, 1875	5,000
August 14, 1876	5,000
June 18, 1878	5,000
For North Landing River, Virginia and North Carolina—	
March 3, 1879	25,000
June 14, 1880	15,000
March 3, 1881	7,500
August 2, 1882	8,000
For Currituck Sound, Coanjock Bay, and North River Bar, North Carolina—	
June 18, 1878	20,000
For Currituck Sound, Coanjock Bay, and North River Bar, North Carolina—Continued.	
March 3, 1879	$25,000
June 14, 1880	25,000
March 3, 1881	30,000
August 2, 1882	20,000
July 5, 1884	5,000
August 5, 1886	10,000
August 11, 1888	7,500
For Inland Water Route, etc.—	
September 19, 1890	10,000
July 13, 1892	9,000
August 17, 1894	10,000
June 3, 1896	10,000
Total	277,000

NOTE.—Amount received from sale of property to other works, $2,169.69.

Abstract of bids for dredging the Southern Branch of the Elizabeth River, Virginia, received in response to advertisement dated May 11, 1897, and under specifications of the same date, opened at Norfolk, Va., at noon, June 22, 1897, by Capt. Thomas L. Casey, Corps of Engineers.

No.	Name and address of bidder.	Price bid per cubic yard.		Daily amount guaranteed to be excavated.	Number and kind of machines.
		Deposited from scows.	Placed on shore.		
		Cents.	*Cents.*	*Cubic yds.*	
1	Nannie H. Baker, Berkley, Va. *a*	29	35	200	1 bucket dredge.
2	Chester T. Caler, Norfolk, Va. *b*	23	33	400	1 Osgood dredge.

a Commence work thirty days after notification of award of contract and complete in five months.
b Commence work on or before December 1, 1897, and complete in five months.

Amount available for dredging under contract, $7,000.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the Inland Water Route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina, during the calendar year 1896 were compiled from a statement furnished by Mr. Franklin Weld, president of the Albemarle and Chesapeake Canal Company:

Articles.	Amount.	Value.
	Tons.	
Lumber	246,284	$1,440,761
Produce	19,186	581.719
Groceries	11,224	1,164,714
Guano	13,374	342,909
Coal	7,408	35,558
Cotton	8,952	1,253,280
Fish	1,223	61,150
Ice	764	3,056
Miscellaneous	14,532	2,716,902
Total	322,947	7,600,049

Vessels.	Number.	Average tonnage.	Average draft.
		Feet.	
Steam	3,188	6.5	82
Sail	1,378	5.5	46
Barges	1,254	6	175
Lighters	108	4	100
Rafts	271	.....	.....
Total	6,199	.....	.....

Approximate amount of all kinds of freight passing through this route.

Year.	Tons.	Year.	Tons.
1888	335,758	1893	296,520
1889	372,617	1894	285,455
1890	403,111	1895	324,866
1891	328,609	1896	322,947
1892	281,542		

K 8.

IMPROVEMENT OF NORTH LANDING RIVER, VIRGINIA AND NORTH CAROLINA.

Operations on this improvement have been confined during the fiscal year to the removal of sunken logs from the channel between the county bridge at North Landing, Virginia, and Pungo Ferry, by hired labor, using the snag boat *Roanoke.*

The snag boat was employed during the month of September, 1896, on this improvement, removing 290 logs and placing them on the banks. The funds being about exhausted, the balance of the expenditures for work were borne by the Inland Water Route, of which this improvement forms a part. The work done thereafter was as follows: Between October 1 and 11, 1896, and from March 4 to April 30, 1897, 457 logs, 2 stumps, 3 trees, and 2 long piles were removed.

As this work forms a part of the "Inland Water Route," the betterment of which is now carried on under a single project, future work will be provided for from funds appropriated for that improvement.

Commercial statistics and other information for this improvement are similar to that given in the report on the Inland Water Route, etc., to which reference is respectfully made.

Money statement.

July 1, 1896, balance unexpended	$723.81
June 30, 1897, amount expended during fiscal year	723.81

APPROPRIATIONS.

March 3, 1879	$25,000
June 14, 1880	15,000
March 3, 1881	7,500
August 2, 1882	8,000
Total	55,500

NOTE.—Amount received from sale of property to other works, $2,169.69.

K 9.

IMPROVEMENT OF ROANOKE RIVER, NORTH CAROLINA.

During the fiscal year ending June 30, 1897, the snag boat *Roanoke*, belonging to this improvement, has been at work on the river at such times as the stage of water would permit.

From July 6 to 12, 1896, the river was subjected to one of the severest freshets ever known, the water at Halifax, N. C., rising to within 8 inches of the highest recorded stage. After the river had resumed its normal summer stage, sickness among the crew of the snag boat, which had remained in the river during the freshet, prevented any work being done and compelled the withdrawal of the boat from the river.

After being employed in the removal of sunken logs from the "Inland Water Route," the snag boat returned to the river on October 27, 1896, and remained until January 21, 1897, when it became necessary to descend on account of ice, returning on June 21, 1897. The boat has been at work on the river from that date until the present time.

During the fiscal year the snag boat has patrolled the river from its mouth to Halifax, N. C., removing from the channel and banks 45 trees, 4 logs, 9 stumps, and 7 snags.

At present there are only two steamers navigating the river regularly, one of which runs from Edenton, N. C., to Williamston, N. C., carrying passengers and freight in connection with the Norfolk and Southern Railway; the other, the steamer *Bertie*, runs from Plymouth to Windsor, N. C., on the Cashie River. In addition to these there is a small steamboat, owned by a lumber company at Plymouth, N. C., and employed in carrying their products to Edenton, N. C., and also in towing rafts and schooners.

While full statistics could not be obtained, it can be readily seen that the commerce of this stream is decreasing rapidly when it is stated that of the eight steamers plying the river regularly in 1894 only two now remain.

The river is paralleled by railroads as far up as its improvement is contemplated under the approved project at a distance from it nowhere exceeding 7 miles, affording better transportation facilities on account of shortened distances to the more important cities, and consequent saving of time.

Whether the present or prospective demands of commerce will warrant the expenditure of any portion of the present available balance for

dredging and jetty construction as proposed in the project for the expenditure of the appropriation of June 3, 1896, approved July 14, 1896, is a question which can only be determined after investigation. It is proposed to give this subject attention when the survey of the river recommended in the project referred to above can be made this coming autumn.

No further appropriation is considered necessary at present, as the available funds will suffice for any improvement which the present commerce would seem to justify.

This river is in the collection district of Albemarle, N. C., and Edenton, N. C., is the nearest port of entry. Nearest light-house, Roanoke River Light, North Carolina, at mouth of river. Nearest fort, Fort Monroe, Va.

The amount of revenue collected at the port of Edenton, N. C., during the fiscal year ended June 30, 1897, is $15.

Money statement.

July 1, 1896, balance unexpended	$45,183.36
June 30, 1897, amount expended during fiscal year	5,641.85
July 1, 1897, balance unexpended	39,541.51
July 1, 1897, outstanding liabilities	535.00
July 1, 1897, balance available	39,006.51
Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	41,000.00

APPROPRIATIONS.

March 3, 1871	$20,000	August 11, 1888	$40,000
June 10, 1872	10,000	September 19, 1890	25,000
March 3, 1873	10,000	July 13, 1892	50,000
June 23, 1874	5,000	August 17, 1894	30,000
August 2, 1882	5,000	June 3, 1896	10,000
July 5, 1884	3,000		
August 5, 1886	20,000	Total	228,000

NOTE.—Amount received from sale of property to other works, $1,338.

COMMERCIAL STATISTICS.

Only two replies to the inquiries made in regard to the commerce of this stream during the calendar year ending December 31, 1896, were received, their aggregate being 16,599 tons.

Approximate amount of freight of all kinds received and shipped by water.

Year.	Tons.	Year.	Tons.
1870	150,000	1892	42,039
1890	182,700	1893	121,024
1891	376,181		

K 10.

IMPROVEMENT OF PASQUOTANK RIVER, NORTH CAROLINA.

No work has been done during the fiscal year ended June 30, 1897, and there have been no expenditures.

The river forms the southern outlet of the Dismal Swamp Canal. From its mouth to Elizabeth City the commerce is considerable, but

this portion of the river is not in need of improvement. Above Elizabeth City there is but little traffic and the apparent object of the improvement is to keep the channel above Turners Cut clear of obstructions for navigation by pole or flat boats, which are used for transporting grain and produce raised on the farms adjacent to the river. No statistics as to the commerce could be obtained.

This work is in the collection district of Albemarle, N. C., and Edenton, N. C., is the nearest port of entry. Nearest light-house, Wade Point Light, at mouth of river. Fort Monroe, Va., is the nearest fort.

The amount of revenue collected at the port of Edenton, N. C., during the fiscal year ended June 30, 1897, is $15.

Money statement.

July 1, 1896, balance unexpended	$2,403.02
July 1, 1897, balance unexpended	2,403.02

APPROPRIATIONS.

March 2, 1829	$80
September 19, 1890	3,000
July 13, 1892	3,000
August 17, 1894	1,000
Total	7,080

NOTE.—Amount turned in to surplus fund of the Treasury, $32.75.

K 11.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Wrecks of schooners Henry Lippitt and John C. Haynes.—Work, under contract with D. S. Baum, of Norfolk, Va., for the removal of these wrecks, was continued as detailed in my last annual report (Annual Report of the Chief of Engineers for 1896, pp. 1084, 1085) until July 15, 1896, when the removal of both wrecks was completed.

The localities of the wrecks were thoroughly examined, with the following results: Depth over wreck of the *Henry Lippitt*, 58 feet at mean low tide; over the *John C. Haynes*, from 63 to 68 feet at the same stage of the tide.

The total cost of the removal of these wrecks was $6,199.99, $5,700 of which was expended during the fiscal year ended June 30, 1897.

Wreck of steamer Wyanoke.—The steamer *Wyanoke* was sunk April 28, 1896, in 56 feet of water, about 1,300 feet off Newport News, Va., by collision with the United States cruiser *Columbia*. The *Wyanoke* was an iron side-wheel steamer of 2,067 gross tonnage, 238 feet long, 39.5 feet beam and 21.4 feet depth of hull, and was owned by the Old Dominion Steamship Company. She was built in 1870. Since then she had been rebuilt, riveted, and provided with a false keel.

On September 22, 1896, an allotment of $20,000 was made from the permanent indefinite appropriation for the removal of wrecks, act of June 14, 1880, for the removal of this wreck. Specifications were issued and proposals invited for the work by advertisement dated October 2, 1896. The proposals received in response to the advertisement were opened November 16, 1896. The lowest bid for doing the work was that of Andrew J. Cooper, of New York, N. Y., at $15,990, including vessel and cargo. This bid was accepted and a contract entered into December 7, 1896.

The contractor contemplates raising the vessel by means of inflatable

air bags placed within the hull. With this end in view, work was commenced on March 9, 1897, first to remove the remaining portion of the deck house and then in clearing away the wreckage, removing cargo and mud from the hold, etc. At the close of the fiscal year this preliminary work was nearing completion.

The expenditures during the fiscal year amounted to $594.26 for advertisement, printing, inspection, and office expenses.

Wreck of steamer Helen Smith.—The steamer *Helen Smith* was sunk off the sawmill wharf at Money Point, in the Southern Branch of the Elizabeth River, Virginia, in 14 feet of water. She was a screw freight and passenger steamer of 57.20 gross tonnage, 90 feet in lengh, 16 feet 6 inches beam, and 3 feet 4 inches depth of hull, and was built in 1870.

The wreck of this vessel interfered seriously with the landing of boats at the sawmill wharf and incommoded vessels passing in the night or in foggy weather. Its removal was authorized June 7, 1897. Bids were received for the work of removing the wreck on June 30, 1897 (abstract appended). The bid of William T. White, of Norfolk, Va., at $100.50, was the lowest received and will be accepted, as it is considered reasonable.

Abstract of bids for purchase and removal of wreck and cargo of steamer Wyanoke, lying in the mouth of James River, Virginia, received in response to advertisement dated October 2, 1896, and under specifications of same date, and opened by Capt. Thomas L. Casey, Corps of Engineers, November 16, 1896.

No.	Name and address of bidder.	Amount bid.
1	Merritt's Wrecking Organization, New York, N. Y. *a*	$24,000
2	R. G. & J. S. Packard, New York, N. Y	27,000
3	William H. Virden and John C. Ross, Lewes, Del	20,000
4	Andrew J. Cooper, New York, N. Y. *b*	15,990
5	Morris & Cumings Dredging Co., New York, N. Y	20,440
6	D. S. Baum, Norfolk, Va	18,000

a Commence work April 15, 1897, and complete same on or before 1st day of August, 1897.
b Lowest bid. Contract entered into December 7, 1896.

Amount available for work under contract, $18,500.

Abstract of bids for the removal of wreck of steamer Helen Smith in the southern branch of Elizabeth River, Virginia, received in response to public notice dated June 12, 1897, and under specifications of the same date, and opened by Capt. Thomas L. Casey, Corps of Engineers, June 30, 1897.

No.	Name and address of bidder.	Amount bid.
1	William T. White, Norfolk, Va. *a*	$100.50
2	Eugene Whitney, Norfolk, Va	235.00
3	W. H. French, Norfolk, Va	170.00
4	Britton & Wilson, Norfolk, Va	138.88

a Lowest bid.

Amount available for work under contract, $220.

LIST OF CONTRACTS IN FORCE.

Name and address of contractor.	Date of approval.	Date of beginning work.	Date of expiration.
D. S. Baum, Norfolk, Va	Feb. 17, 1896	Feb. 26, 1896	July 15, 1896
Andrew J. Cooper, New York, N. Y	Dec. 16, 1896	Mar. 9, 1897	Aug. 1, 1897

K 12.

PRELIMINARY EXAMINATION OF CASHIE RIVER, NORTH CAROLINA.

[Printed in House Doc. No. 88, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of October 19, 1896, by Capt. Thomas L. Casey, Corps of Engineers, of the results of a preliminary examination of Cashie River, North Carolina, made to comply with requirements of the river and harbor act of June 3, 1896.

It is the opinion of Captain Casey, concurred in by Col. Peter C. Hains, Corps of Engineers, Division Engineer, and by me, that Cashie River is not at present worthy of improvement by the General Government to a further extent than the removal of snags, leaning trees, and similar obstructions.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF CAPT. THOMAS L. CASEY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., October 19, 1896.

GENERAL: The river and harbor act of June 3, 1896, called for a preliminary examination of the Cashie River, North Carolina, with a view to its improvement by the General Government, and I have the honor to submit the following report, based upon an examination made September 17 and 18, 1896.

The Cashie is one of the tortuous fresh-water affluents of Albemarle Sound, forming in reality one of the mouths of the Roanoke, with which there is free communication by way of a stream known as the Thoroughfare. The lumber tows generally make use of the main stem of the Cashie, while nearly all other craft go through the Thoroughfare and thence down the Roanoke. The available depth at the mouth of the Cashie is about 8.5 feet, and this is the least depth below the Thoroughfare. According to the lumbermen, it is ample for their purposes, and this portion of the river therefore needs no further consideration.

The Cashie from the Thoroughfare to Windsor, the head of navigation, is amply wide and deep for all present needs of navigation, the least depth at the former point being some 9.5 feet; at Windsor it is 12 feet. The stream is, however, very tortuous, boats of moderate length having frequently to back in order to maneuver around the bends, and the principal obstacle to free navigation is formed by the snags and overhanging trees. In addition it is stated that the turn at the Thoroughfare is difficult at high stages of the Roanoke and that a turning basin at Windsor would be of great benefit. This latter could be readily accomplished by cutting through the neck of the bend and allowing steamers to go around the island thus formed.

The country bordering the Cashie seems to be in thriving condition and is a fine agricultural region, cotton, peanuts, and pease being the chief products; tobacco is also grown to some extent. Windsor, the county seat of Bertie County, has, according to the most recent census, a population of 800, and is said to do more business in proportion to its size than any other town in the State.

In regard to the present river trade it should be mentioned that the steamer *Bertie* of 58 tons makes daily trips from Plymouth to Windsor, carrying the United States mails and doing a business, from January to July, 1896, of $4,940 inward and $1,140 outward. The steamers *Lucy* and *C. W. Pettit*, of Pettit's Line, make one or two trips weekly from Norfolk to Windsor, doing a business from January 1 to July 1, 1896, of $4,200, as stated in a letter received from the general manager. Johnson's mill ships 15,000,000 to 20,000,000 feet of lumber per year, and the Branning Company cut about 100,000 feet of logs per day, but these mills are not far up the river, have no complaint to make in regard to navigation facilities, and do not request any improvement. The estimated value of the river trade for one year is $198,940, the lumber being valued at $8 per 1,000. The lumber on the lower river amounts to $400,000, making a total for the entire river of about $598,940.

The nearest railway is 16 miles distant, and no merchandise comes in that way. The Roanoke River is 9 miles from Windsor, and the Chowan 15 miles. This section is dependent altogether upon the river for its transportation facilities. The Wellington and Powelsville Railroad, a narrow-gauge logging road, passes about 7 miles from Windsor, and there is some probability of a branch to that place in the near future, and a connection with the Norfolk and Carolina at Ahaskie. There is also a probability of the establishment of a line of steamers from Wellington to Edenton as a connection of the Norfolk and Southern Railroad.

The amount of merchandise purchased and carried over the river from January to July, 1896, as shown by the tax list, is as follows:

Merchandise		$60,144
Drugs and liquors		$3,208
Coal, 15 tons (approximate)		$90
Cigars	number	60,750
Tobacco	pounds	6,644

The outward shipments for the last twelve months are given approximately as follows:

Cotton (1,250 bales)	$43,750
Peanuts (17,650 bags)	35,300
Black-eye pease (1,275 bags)	2,550
Cotton seed	555
Railroad ties (10,000)	3,500
Oak piles (300)	900

I am of opinion that the Cashie is not at present worthy of improvement by the General Government, but the snags complained of will be removed by the Government snagger *Roanoke*, now in those waters, if it is allowable to consider the Cashie a part of the Roanoke navigation.

Respectfully submitted.

THOS. L. CASEY,
Captain, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., October 23, 1896.

Respectfully submitted to the Chief of Engineers, U. S. A.

I concur in the opinion of Captain Casey that Cashie River, North Carolina, is not worthy of improvement by the General Government.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

K 13.

PRELIMINARY EXAMINATION OF POTECASI CREEK, NORTH CAROLINA.

[Printed in House Doc. 124, Fifty-fourth Congress, second session].

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated October 19, 1896, by Capt. Thos. L. Casey, Corps of Engineers, of results of preliminary examination of Potecasi Creek, North Carolina, made to comply with the provisions of river and harbor act of June 3, 1896.

It is the opinion of Captain Casey, concurred in by the division engineer, Col. Peter C. Hains, Corps of Engineers, and by me, that Potecasi Creek is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF CAPT. THOMAS L. CASEY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., October 19, 1896.

GENERAL: The river and harbor act of June 3, 1896, called for a preliminary examination of Potecasi Creek, North Carolina, with a view to its improvement by the General Government, and I have the honor to submit the following report, based upon an examination made September 16, 1896:

Potecasi Creek is a small tributary of the Meherrin River, entering it about a mile above its mouth. The creek has a width of about 125 feet to the head of navigation, and vessels of 7 to 8 feet draft can ascend between 8 and 10 miles. Those of 4 to 5 feet depth can go about 5 miles farther, where a bridge crosses the stream. This bridge has no draw and the stream above it rapidly decreases to a depth of about 18 inches, with hard bottom. The banks are high for the greater part of its course and the creek is subject to heavy freshets. During these freshets a large number of logs are floated down from the head waters of the stream. Logs, which are always floated, together with a few

railroad ties shipped from the lower portion of the creek, constitute the entire amount of trade by water.

The surrounding country is not very productive—cotton, peanuts, and corn being the principal products. The timber and ties are almost exhausted, and there seems to be but little prospect of any improvement in the trade of the neighborhood. Possibly 8,000 logs and 3,000 ties were sent down the creek last year.

There are no wharves or landings on the creek. Tugs go up 8 miles after logs, and once in a while a barge loads with ties.

Mapleton, on the Meherrin, and Winton, on the Chowan, are the shipping points for all farm products and are more convenient than the creek. These places have regular lines of steamers. Camp's lumber railroad penetrates the country from Winton, and is said to reach the identical territory that would be served by the creek. The Seaboard Air Line, 7 miles to the west, and the Norfolk and Carolina, 8 miles to the eastward, furnish short and direct outlets, while the Norfolk and Southern have connecting boats from Edenton running up the Chowan. The water route to Norfolk is about 175 miles, against 67 by rail. The opinions of the more prominent residents are given, as follows:

Mr. Edgar Brett (merchant), Mapleton:

"It is no stream worth mentioning. Mapleton is more convenient. Above the bridge the water is only 18 inches deep, with hard marl bottom. About 7,000 bags of peanuts are shipped from Mapleton each year."

Mr. G. E. Garmen (operates a sawmill at head of navigation, but ships no lumber):

"My mill is 15 miles from the mouth of the creek by water and only about 6 by land. Logs and obstructions would soon be as bad as now, even if removed, as the raft logs are always sinking. Know of nothing to be gained by improvement. Camp Manufacturing Company, of Franklin, had spoken of running a log road to the creek."

Mr. Patrick Taylor, Winton:

Has shipped ties and lumber out of the creek for twenty years. His boats go up the creek and have no difficulty. The log road parallels the creek and all logs go to the Chowan. Mapleton is more convenient than the creek would be. There are some few snags in the creek. He can not see where the expenditure of $100 could be justified.

Mr. B. N. Branch (Tunis's manager), Tunis:

"We probably get more logs out of the creek than anyone else. Possibly 15,000 or 20,000 logs have come out of the creek during the last two years. The creek is subject to heavy freshets. I am not able to see any reason for the improvement of the creek."

In my opinion Potecasi Creek is not worthy of improvement by the General Government.

Respectfully submitted.

THOS. L. CASEY,
Captain, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., October 23, 1896.

Respectfully submitted to the Chief of Engineers, United States Army.

I concur in the opinion of Captain Casey that Potecasi Creek, North Carolina, is not worthy of improvement by the General Government.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

APPENDIX L.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN NORTH CAROLINA.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, LIEUT. COL. D. P. HEAP AND CAPT. W. E. CRAIGHILL, CORPS OF ENGINEERS.

IMPROVEMENTS.

1. Ocracoke Inlet, North Carolina.
2. Fishing Creek, North Carolina.
3. Pamlico and Tar rivers, North Carolina.
4. Contentnia Creek, North Carolina.
5. Trent River, North Carolina.
6. Neuse River, North Carolina.
7. Inland waterway between Newbern and Beaufort, North Carolina.
8. Harbor at Beaufort, North Carolina.
9. Inland waterway between Beaufort and New River, North Carolina.
10. New River, North Carolina.
11. North East (Cape Fear) River, North Carolina.
12. Black River, North Carolina.
13. Cape Fear River above Wilmington, North Carolina.
14. Cape Fear River at and below Wilmington, North Carolina.
15. Lockwoods Folly River, North Carolina.

EXAMINATION.

16. For jetty near Bogue Inlet, North Carolina.

SURVEYS.

17. Ocracoke Inlet, North Carolina.
18. Pamlico River and Washington Harbor, North Carolina.
19. Neuse River, North Carolina.
20. Harbor of refuge at Cape Lookout, North Carolina.
21. Town Creek, North Carolina.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 17, 1897.

GENERAL: I have the honor to transmit herewith annual reports and summaries * * * for fiscal year 1897 upon the works under my charge.

Very respectfully, your obedient servant,

W. E. CRAIGHILL,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

L 1.

IMPROVEMENT OF OCRACOKE INLET, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report, Chief of Engineers, for 1896, page 1097.

At the beginning of the fiscal year dredging was in progress under contract with Chester T. Caler, dated September 20, 1894, at 31 cents per cubic yard, measured in place.

The work in Royal Shoal was completed in October, 1896; 80,608.73 cubic yards having been removed during the fiscal year.

Work was then commenced at Beacon Island Slough, and continued until it was completed, on January 1, 1897; 15,989.32 cubic yards were dredged at this point from a cut 779 feet long.

Both cuts were made to give a channel width of 300 feet and depth of 9 feet at mean low water.

As much doubt was entertained by Major Stanton, the engineer in charge when this improvement was commenced, as to its permanence, a survey was made in June, 1897, to ascertain its condition.

It has been found that the Royal Shoal Cut is maintaining its depth, but the Beacon Island Slough Cut has filled so that the greatest depth is 8.7 feet for a width of but 75 feet, and on the northern edge the shoaling amounts to as much as 2 feet.

No complaints on account of diminished depth have been made from vessels using the channels.

This inlet is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1896, balance unexpended	$63,253.25
June 30, 1897, amount expended during fiscal year	45,870.22
July 1, 1897, balance unexpended	17,383.03
July 1, 1897, outstanding liabilities	488.16
July 1, 1897, balance available	16,894.87
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	(*)

Ocracoke Inlet, North Carolina.

Appropriated—

March 20, 1826, to March 3, 1837	$133,750.00
September 19, 1890	90,000.00
July 13, 1892	15,000.00

The commerce of Ocracoke Inlet is estimated by Asst. Engineer W. H. Chadbourn, jr., at 50,000 tons of grain, lumber, shingles, fertilizers, and general merchandise.

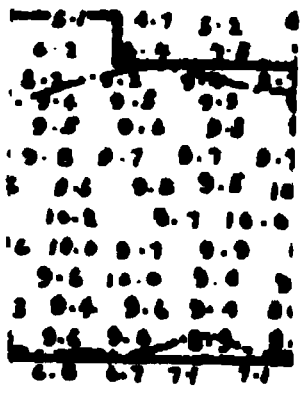
Abstract of proposals for boiler, engine, etc., for steamer General George Thom, opened at Wilmington, N. C., at 3 o'clock p. m., July 1, 1896, by Lieut. Col. D. P. Heap, Corps of Engineers.

No.	Name and address of bidder.	Item 1, boiler, engine, shaft, etc.	Item 2, wheel and accessories.	Item 3, condenser, hot well, and accessories.	Item 4, steam capstan.
1	The Roberts Safety Water Tube Boiler Co., New York, N. Y.	*a* $2,285 *b* 2,085 *c* 1,650	$40	*d* $490 *e* 525	*f* $290 *g* 330
2	Wheeler Condenser and Engineering Co., New York, N. Y.	.....	.....	590	.....

a Style 1. *b* Style 2. *c* Style 3. *d* Wheeler's. *e* Hambly's. *f* American Ship Windlass Co.'s nonreversing. *g* Reversing.

Recommended that awards be made as follows: To bidder No. 1, The Roberts Safety Water Tube Boiler Co., for item 1 at $2,285, item 2 at $40, item 3 at $490, and item 4 at $290.

*Present available balance sufficient should it become necessary to maintain the project depth (which has been obtained) by redredging.



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COMMERCIAL STATISTICS.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., April 17, 1897.

CAPTAIN: I have the honor to report concerning commercial statistics and list of vessels for Ocracoke Inlet, North Carolina, that I have been unable to secure any definite data on the subject.

The greater portion of the exports and imports of the rivers tributary to Pamlico Sound does not pass through Ocracoke Inlet; so the commerce of the latter can not be made up from that of the rivers (and many of the tributaries we have no statistics for) unless we knew the route each shipment took, which we do not.

I am certain that the commerce of Ocracoke Inlet has materially increased by reason of the completion of the dredging there, since the ocean-bound commerce of Pamlico Sound was formerly divided between Ocracoke and Hatteras, whereas nearly all passes out of Ocracoke now.

I would estimate the commerce for the year 1896 at 50,000 tons, consisting of lumber, fertilizers, grain, shingles, coal, and general merchandise.

Very respectfully, your obedient servant,

WM. H. CHADBOURN, Jr.,
Assistant Engineer.

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 2.

IMPROVEMENT OF FISHING CREEK, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects, see Annual Report Chief of Engineers for 1896, page 1100.

The work during the year has consisted of removing snags and logs from the channel and clearing overhanging trees from the banks.

In December, 1896, the provision of the appropriation act, that the money should not be available until draws were provided in the bridges that were unreasonable obstructions to navigation, had been complied with and work by hired labor and the use of the United States plant was then commenced.

Since March 4, 1897, two hoisters have been at work in the creek. They have removed from the channel 4,085 large snags, 456 stumps, 256 logs, 1,044 trees, and 49⅞ cords small snags, and from the banks, 634 trees hauled back, 178 trees trimmed, and 117¼ cords brush cut.

The work was commenced at the mouth of the creek and is completed for 12 miles.

This creek is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1896, balance unexpended	$14,962.97
June 30, 1897, amount expended during fiscal year	5,648.52
July 1, 1897, balance unexpended	9,314.45
July 1, 1897, outstanding liabilities	828.95
July 1, 1897, balance available	8,485.50
Amount (estimated) required for completion of existing project	7,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	* 9,250.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

* One thousand five hundred dollars included for maintenance.

Appropriated.

September 19, 1890	$10,000
July 13, 1892	5,000

COMMERCIAL STATISTICS.

One thousand tons timber in rafts, valued at $2 per ton. Loss over last year, 700 tons.

L 3.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, NORTH CAROLINA.

[One river, called the Pamlico below and the Tar above Washington.]

For previous history of this improvement and detailed statements of projects, see Annual Report of Chief of Engineers for 1896, page 1101.

The operations during the year ending June 30, 1897, have been carried on by hired labor and use of the United States plant.

Obstructions were removed from the river above Greenville to Fishing Creek (34 miles), as follows: From the channel, 653 snags, 20 logs, 90 stumps, and 188 trees, and from the banks 109 trees hauled back and 1 cord brush cut.

Below Washington, where the river begins to take the nature of an estuary, many stumps in place are found in the channel. Those which were most troublesome were included within a length of 3,850 feet. These were removed for a channel width of 200 feet. The channel was then cleared of snags for a further distance of 2½ miles.

This river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1896, balance unexpended	$10,199.00
June 30, 1897, amount expended during fiscal year	5,058.07
July 1, 1897, balance unexpended	5,140.93
July 1, 1897, outstanding liabilities	27.04
July 1, 1897, balance available	5,113.89
Amount (estimated) required for completion of existing project	*38,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	41,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriated for Pamlico and Tar rivers, North Carolina.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000	$10,000	August 5, 1886	$5,000	$58,000
August 14, 1876	15,000	15,000	August 11, 1888	10,000	68,000
May 8, 1879	6,000	21,000	September 19, 1890	10,000	78,000
June 14, 1880	9,000	30,000	July 13, 1892	10,000	88,000
March 3, 1881	8,000	38,000	August 17, 1894	10,000	98,000
August 2, 1882	10,000	48,000	June 3, 1896	5,000	103,000
July 5, 1884	5,000	53,000			

*Three thousand dollars annually for cost of maintenance and snagging not included.

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	3,722	Oysters	215
Cotton seed	2,861	Rosin	212
Cotton-seed meal	1,012½	Turpentine:	
Tobacco, leaf	15	Crude	174
Rice	87½	Spirits	45½
Grains	10,131	Wood	1,820
Hay	5,926	Timber	85,464
Potatoes	5,162	Lumber	96,172
Vegetables	167½	Shingles	1,790½
Cattle	180½	Fertilizers	10,162
Horses	165	Coal and minerals	4,500
Hogs	30	General merchandise	21,490½
Poultry	12	Machinery	50
Eggs	86½		
Fish	233½	Total	251,887½

Number of passengers, 10,168.

Gain since last year, 68,660½ tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1875	21,000	1893	119,505
1890	277,832	1894	119,979
1891	195,600	1895	183,226½
1892	107,097		

Statement of vessels navigating Pamlico and Tar rivers, North Carolina, during the calendar year ending December 31, 1895.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers and steam tugs	36	2,680.87	3 to 9
Barges	36	8,040.55	6 to 7
Schooners	57	3,013.00	2.5 to 7.5
Sloops	2	26.28	3 to 3.5

L 4.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report of Chief of Engineers for 1896, page 1103.

The operations of the year have been carried on by hired labor and use of United States plant, and have consisted in dredging in the shoals at the mouth of the creek and in removing snags and other obstructions.

The work has been under the charge of Mr. William H. Chadbourn, jr., assistant engineer, an extract from whose report, submitted herewith, gives details of the year's work.

This creek is in the second collection district of North Carolina.

Money statement.

July 1, 1896, balance unexpended	$4,605.44
June 30, 1897, amount expended during fiscal year	2,474.94
July 1, 1897, balance unexpended	2,130.50
July 1, 1897, outstanding liabilities	88.10
July 1, 1897, balance available	2,042 40
Amount (estimated) required for completion of existing project	*8,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	5,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

*Two thousand dollars annually for cost of maintenance and snagging not included

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881	$10,000	$10,000	August 11, 1888	$5,000	$45,000
August 2, 1882	10,000	20,000	September 19, 1890	7,000	52,000
July 5, 1884	5,000	25,000	July 13, 1892	7,000	59,000
August 5, 1886	15,000	40,000	August 17, 1894	10,000	69,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	930	Oysters	11
Grains	14½	Timber	9,600
Hay	70	Lumber	2,050
Potatoes	282	Shingles	590
Vegetables	307½	Fertilizers	2,400
Horses	3	Coal and minerals	25
Poultry	½	General merchandise	495
Eggs	4		
Fish	22½	Total	16,804½

Number of passengers, 600.

Gain since last year, 4,186¼ tons, excluding timber. Extreme low water curtailed this item largely. Transportation lines established, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1890	125,225	1893	21,173
1891	55,325	1894	19,953
1892	17,491	1895	53,018

Statement of vessels navigating Contentnia Creek, North Carolina, during the calendar year ending December 31, 1895.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	8	204.64	2.5 to 4.5

Four of these steamers make three trips per week whenever the state of water will permit; the others run irregularly.

REPORT OF MR. WILLIAM H. CHADBOURN, JR., ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., April 19, 1897.

CAPTAIN: I have the honor to submit the following report upon the improvement of Contentnia Creek, North Carolina, for the fiscal year ending June 30, 1897.

* * * * * * *

With the expenditure of the year, all the shoals have been removed and the creek has been resnagged from Snow Hill to its mouth. The dredging was in Spring Slough, through the river swamp, and many cypress stumps were encountered, some of them very large. Four thousand and fifty-one cubic yards of material was removed from a channel 30 feet wide, 3 to 4½ feet deep at nine-mouths' stage, and 1,760 feet long. Seventy-six stumps and 15 embedded logs, snags, and trees were removed by the dredge. The dumpage was placed on the right bank, forming a rough dike to prevent the water flowing through the swamp to Neuse River. At

the upper end of the dredging the dike was connected to the highest land available. This dredging was done by the United States hoister *Albemarle*, and cost 24.3 cents per cubic yard. This cost included considerable repairs to the bucket and machinery and purchase of some heavy blocks.

There have been removed by the hoister *Neuse* from the channel, 2 flats, 68 trees, 26 logs, 118 snags, and 98 stumps; and from the banks, 96 trees cut and hauled back, 6 logs, 33 snags, and 46 stumps hauled back.

At the close of the year the creek below Snow Hill is in better condition than ever before. The project depth exists and it is clear of snags. With the exception of two sharp bends in the lower narrows, which need some attention, the creek in this portion is all that can be desired. Above Snow Hill to Stantonsburg the creek is very much obstructed by snags, logs, fallen and submerged trees.

The steamer *Nettie W.* has made 10 trips above Snow Hill since January, 1897, running as far as Speights Bridge, 20 miles above Snow Hill, and within 13 miles of Stantonsburg; the boat was very much hampered by fallen trees, logs, stumps, etc., the creek not having been worked above Snow Hill since 1891.

For the first five months of the year the water was exceptionally low, suspending navigation, which is the cause of the light commerce.

The very favorable dredging results are due to the untiring efforts and very efficient management of Overseer S. E. Ewell, to whom my thanks are due.

Very respectfully, your obedient servant,

WM. H. CHADBOURN, JR.,
Assistant Engineer.

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 5.

IMPROVEMENT OF TRENT RIVER, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report of Chief of Engineers for 1896, page 1106.

There has been no work done on this river during the year. An examination near the end of the year indicates that its condition has been maintained without change of importance during the year, except that there are some snags and logs in the channel.

This river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1896, balance unexpended	$2,237.36
June 30, 1897, amount expended during fiscal year	162.59
July 1, 1897, balance unexpended	2,074.77
July 1, 1897, outstanding liabilities	161.21
July 1, 1897, balance available	1,913.56
Amount that can be profitably expended in fiscal year ending June 30, 1899, for maintenance	2,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1879	$7,000	$7,000	August 11, 1888	$5,000	$50,500
June 14, 1880	10,000	17,000	September 19, 1890	5,000	55,500
March 3, 1881	5,000	22,000	July 13, 1892	5,000	60,500
August 2, 1882	10,000	32,000	August 17, 1894	4,000	64,500
July 5, 1884	10,000	42,000	June 3, 1896	2,000	66,500
August 5, 1886	3,500	45,500			

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Foreign and coastwise:		**Internal:**	
Cotton	5,603½	Cotton	971
Cotton seed	8,010	Cotton seed	334
Cotton-seed meal	120½	Cotton-seed meal	64
Cotton-seed oil	2	Rice	2
Tobacco	3½	Grains	38½
Rice	15½	Hay	121
Grains	8,397	Potatoes	161
Hay	2,541	Vegetables	28
Potatoes	7,279½	Cattle	18½
Vegetables	9,040½	Hogs	3½
Cattle	65½	Poultry	13
Horses	117	Eggs	10½
Hogs	14½	Oysters	9
Poultry	30½	Turpentine:	
Eggs	166½	Crude	140
Fish	2,117½	Spirits	7½
Oysters	1,990	Wood	124½
Clams	1,200	Timber	14,652
Rosin	1,408	Lumber	854
Turpentine:		Shingles	303
Crude	157	Fertilizers	330
Spirits	558	Machinery	203½
Wood	14,265	Coal and minerals	37
Timber	14,050	General merchandise	1,032½
Lumber	16,464	Horses	3½
Shingles	905	Rosin	173½
Fertilizers	18,690		20,124½
Machinery	1,119½	**SUMMARY.**	
Coal and minerals	1,805		
General merchandise	15,840½	Foreign and coastwise	121,976½
	121,976½	Internal	20,124½
		Total	142,100½

Number of passengers, 11,944.

Decrease since last year in internal commerce, 21,231½ tons. Gain over last year in foreign and coastwise commerce, 20,889½ tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1878	22,000	1893	34,649
1890	89,985	1894	28,055
1891	45,080	1895	142,422½
1892	59,576		

Statement of vessels navigating Trent River, North Carolina, during the calendar year ending December 31, 1895.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	36	1,837.22	2.0 to 7.5
Barges	10	2,375.27	7.0 to 7.5
Schooners, sloops, etc	149	5,667.97	2.0 to 7.0

Eleven of the above-mentioned steamers are the only vessels navigating Trent River above Newbern, N. C.

L 6.

IMPROVEMENT OF NEUSE RIVER, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report, Chief of Engineers, for 1896, page 1109.

During the year ending June 30, 1897, the river has been snagged from near Goldsboro to Newbern, jetties have been constructed at Pitch Kettle, near Biddles Landing, and at Bectons Old Field and commenced at Maple Cypress and Wing Dam Crossing, and bank protectors were built at Maple Cypress and at the twenty-eighth mile-post, besides repairs to old work where most urgently needed.

The most satisfactory form of new jetties has been two rows of round piles about 4 feet apart, filled in between with brush, with a 6 by 8-inch waling bolted to the upstream row. This type costs from $1 to $1.50 per linear foot.

The method pursued with successful results has been to combine dredging with the jettying. The amount of contraction has thus been made the minimum required to maintain the project depth.

The material to be removed has been taken out with the dredge at a cost of 18½ cents per cubic yard.

This improvement has been under the immediate charge of Asst. Engineer William H. Chadbourn, jr., an extract from whose report is submitted herewith.

This river is in the collection district of Pamlico, N. C.

Money Statement.

July 1, 1896, balance unexpended	$11,470.71
June 30, 1897, amount expended during fiscal year	9,190.36
July 1, 1897, balance unexpended	2,280.35
July 1, 1897, outstanding liabilities	85.65
July 1, 1897, balance available	2,194.70
Amount (estimated) required for completion of existing project	*77,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
June 18, 1878	$40,000	$40,000	August 5, 1886	$22,500	$232,500
March 3, 1879	45,000	85,000	August 11, 1888	15,000	247,500
June 14, 1880	45,000	130,000	September 30, 1890	20,000	267,500
March 3, 1881	30,000	160,000	July 13, 1892	15,000	282,500
August 2, 1882	30,000	190,000	August 17, 1894	7,000	289,500
July 5, 1884	20,000	210,000	June 3, 1896	7,000	296,500

* Five thousand dollars annually for cost of maintenance and snagging not included.

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	5,722	Oysters	1,990
Cotton seed	3,115	Clams	1,846
Cotton-seed meal	120½	Rosin	1,408
Tobacco, leaf	5½	Turpentine, crude	360
Rice	15½	Turpentine, spirits	558
Grains	8,467	Wood	14,765
Hay	2,551	Timber	96,897
Potatoes	7,242½	Lumber	86,278½
Vegetables	9,042	Shingles	19,235½
Cattle	85	Fertilizers	15,396½
Horses	123	Machinery	1,134½
Hogs	21½	General merchandise	16,183½
Poultry	32	Coal and minerals	2,208
Eggs	173		
Fish	2,116½	Total	297,092½

Number of passengers, 10,712.
Gain over last year, 19,066¼ tons.
Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1877	75,000	1893	a 50,573
1890	328,462	1894	a 45,258
1891	267,650	1895	278,025½
1892	253,704		

a The statistics for 1893 and 1894 relate entirely to freight carried in bottoms on the river above Newbern. For the preceding years it covered all freight, both above and below Newbern, including rafts

Statement of vessels navigating Neuse River, North Carolina, during the calendar year ending December 31, 1896.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	36	1,837.22	2 to 7.5
Barges	29	7,380.43	6 to 7.5
Schooners, sloops, etc	184	6,835.13	2 to 7.5

REPORT OF MR. WILLIAM H. CHADBOURN, JR., ASSISTANT ENGINEER.

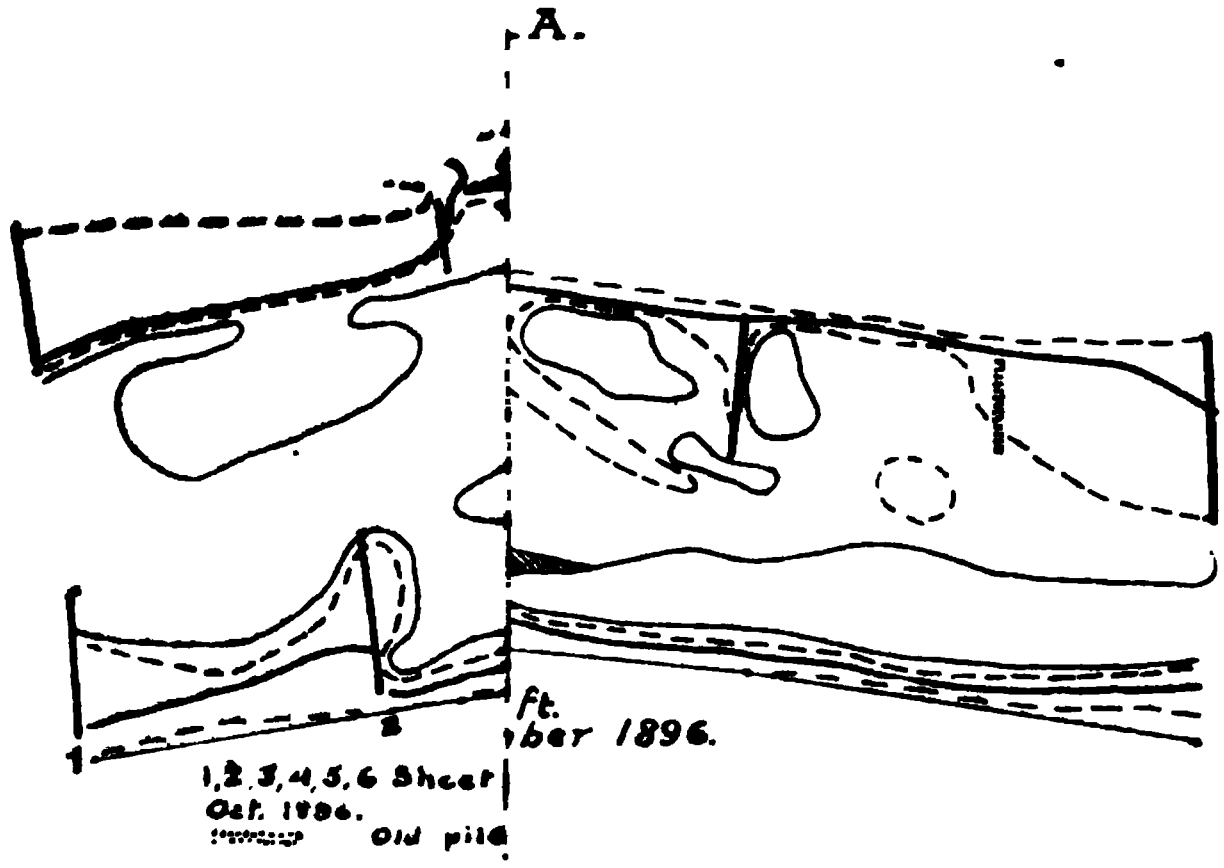
UNITED STATES ENGINEER OFFICE,
Newbern, N. C., June 4, 1897.

CAPTAIN:

* * * * * * *

By the expenditures of the fiscal year ending June 30, 1897, the river had been thoroughly snagged from Wilmington and Weldon Railroad Bridge (94 milepost), near Goldsboro, to Newbern.

There have been removed from the channel 221 snags, 1 cord small snags, 110 stumps, 74 logs, 121 trees, and 91 old piles, and from the banks 45 trees were cut and pulled back, 3 stumps pulled, and 7 logs rolled back. Jetties have been constructed at Pitch Kettle, at and below 27 milepost, near Biddles Landing, 29 milepost, one-fourth below 30 milepost, and at Bectons Old Field; commenced at Maple Cypress and Wing Dam Crossing; repaired or extended at Maple Cypress, at and below 27 milepost. near Biddles Landing, 29 milepost, one-fourth below 30 milepost, and 31½ milepost; bank protectors were built at Maple Cypress and 28 milepost. Some of the old jetties repaired and extended were built of sheet piles and others of piling and brush. The same construction was followed in repairing or extending them. The new jetties constructed were built of two rows of round piling about 4 feet apart, filled in between with brush, with a 6 by 8 inch wale bolted to upstream row. This



nnual Report June 30, 1897.

E. Craighill
Corps of Engrs. U.S.A.

type cost from $1 to $1.50 per linear foot, according to location, difficulties encountered, and continuity of the work. The partially completed jetties at Maple Cypress and Wing Dam Crossing are built of a single row of round piling closely driven. This type of jetty is difficult to build and is apt to wash up, since if one pile is knocked down by rafts or boats the others are loosened and quickly come up. At most places where jetties were built trees were cut into the river to assist it directing the current and contracting the channel. As far as my observation goes, this plan works well. Trees have also been cut in below many jetties which were built perpendicular to the current, to retard the eroding effect below the jetty caused by the water pouring over. In the jetty work 1,265 round and square piles and 386 sheet piles have been driven and 218½ cords of brush used. A channel 35 feet wide, 4 to 5 feet deep, was dredged across each of the eight shoals below mouth of Contentnia Creek, aggregating 3,331 feet in length. Five thousand five hundred and fifty cubic yards of material were removed and deposited, usually on the bank, in a few instances near the side of the cut. This dredging, although it was skimming and many logs, trees, etc., were encountered in excavating, cost only 18½ cents per cubic yard. This includes an equitable proportion of general charges. It was done by the U. S. hoister *Albemarle*, having a 1-yard Hayward bucket fitted to the fall on a boom.

Surveys have been made of shoals at Wing Dam Crossing, Maple Cypress, Grindle Creek, 29 milepost, one-fourth below 30 milepost, 31 milepost, Nelsons Landing, Caswell, Blue Banks, and Grays, aggregating 2.84 miles of river surveyed. Gauge observations at Kinston and Newbern the entire year.

* * * * * * *

There are at present time twelve steamers navigating the Neuse to various points between Newbern and the mouth of Contentnia. There is not much navigation above that, although during the spring and fall steamers run up to Whitehall, and a small steamer has run as far as the 131st milepost. This latter steamer runs principally between Goldsboro (98 milepost) and 131st milepost. The owner reports that he has made at least seventy-five trips during the year and could have done much better if the various bridges were provided with suitable draws.

Very respectfully, your obedient servant,

W. H. CHADBOURN, Jr.,
Assistant Engineer.

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 7.

IMPROVEMENT OF INLAND WATERWAY BETWEEN NEWBERN AND BEAUFORT, NORTH CAROLINA, VIA CLUBFOOT, HARLOWE, AND NEWPORT RIVERS.

For previous history of this improvement and detailed statements of projects see Annual Report Chief of Engineers for 1896, page 1113.

There has been no work done during the year and no expenditures have been made.

For description of this waterway and previous operations see Annual Report 1892, pages 1134–1135; 1893, pages 1393–1394; 1894, page 1030, and 1896, page 1113.

This waterway is in the collection district of Pamlico and Beaufort, N. C.

Money statement.

July 1, 1896, balance unexpended	$7,085.61
July 1, 1897, balance unexpended	7,085.61
Amount (estimated) required for completion of existing project	57,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899. Present balance adequate for maintenance.	
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriated.

Date.	Amount.	Aggregate.
August 2, 1882	$10,000	$10,000
August 5, 1886	10,000	20,000
August 11, 1888	15,000	35,000

COMMERCIAL STATISTICS.

From the most reliable estimates that could be obtained the commerce is about the same as or slightly more than that reported for 1896, namely, 29,737 tons.

Assistant Engineer W. H. Chadbourn, jr., writing in this connection says: "I could get no positive information concerning the commerce of this waterway. * * * I do not think best to increase anything. * * * I believe the estimate (that of last year) to be close."

Freight transported.

Calender year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1890	14,000	1893	Not given.
1891	17,390	1894	Not given.
1892	Not given.	1895	29,737

Statement of vessels navigating waterway between Newbern and Beaufort, N. C., during the calendar year ending December 31, 1896.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	4	111.21	3.5 to 4	70
Schooners	32	306.58	2 to 3.5	505
Sloops	5	33.31	2 to 3	85
Sharpies	3	31.56	2.5 to 3	65

L 8.

IMPROVEMENT OF HARBOR AT BEAUFORT, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report of Chief of Engineers for 1896, page 1115.

The work during the year has been by hired labor and use of United States plant, and has been confined to the maintenance of the works previously constructed. At Fort Macon Point 526 feet of new sand fences was built, 2,444 feet was raised, 28,944 feet filled under, and 2,314 feet was repaired; at Shackleford Point 1,510 feet of new sand fences was built, 5,946 feet raised, 27,732 feet was filled under, and 953 feet was repaired. Minor repairs were made to the brush jetties on Shackleford inner shore.

On both sides of the entrance the beaches have been held intact with some improvement, especially at Shackleford Point, by the level of the beach having been raised and extended seaward.

The depth on the bar is reported to be 10½ feet at low water.

Beaufort is a port of entry.

Money statement.

July 1, 1896, balance unexpended	$7,154.68
June 30, 1897, amount expended during fiscal year	1,520.14
July 1, 1897, balance unexpended	5,634.54
July 1, 1897, outstanding liabilities	80.84
July 1, 1897, balance available	5,553.70

Amount that can be profitably expended in fiscal year ending June 30, 1899: Present available balance adequate.
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836	$5,000	$5,000	August 5, 1836	$15,000	$80,000
			August 11, 1838	35,000	125,000
March 3, 1880	30,000	30,000	September 19, 1890	15,000	140,000
August 2, 1882	25,000	55,000	July 13, 1892	10,000	150,000
July 5, 1884	20,000	75,000	June 3, 1896	5,000	155,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	125	Oysters	2,500
Cotton seed	300	Clams	2,000
Tobacco, leaf	15	Rosin	1,200
Rice	75	Turpentine, crude	1,300
Grains	155	Turpentine, spirits	310
Hay	155	Wood	2,500
Potatoes	600	Lumber	7,500
Vegetables	206	Shingles	75
Cattle	100	Fertilizers	1,000
Horses	50	Machinery	100
Hogs	75	Coal and minerals	200
Poultry	15	General merchandise	6,181
Eggs	10		
Fish	12,000	Total	38,807

Number of passengers, 5,000.

Gain over last year, 8,284½ tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1889	25,000	1893	62,913
1890	46,675	1894	Not given.
1891	69,330	1895	30,522½
1892	55,070		

Statement of vessels navigating harbor at Beaufort, N. C., during the calendar year ending December 31, 1896.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	14	5,339.18	5 to 15	424
Schooners and sloops	145	3,340.18	2.5 to 15	2,560

L 9.

IMPROVEMENT OF INLAND WATERWAY BETWEEN BEAUFORT HARBOR AND NEW RIVER, NORTH CAROLINA.

During the past fiscal year the work done has consisted of a continuation of the contract for dredging entered into November 19, 1894, with Cordes & Bochman, of Charleston, S. C., at 35 cents per cubic yard, measured in place.

This contract was completed on November 12, 1896. The material removed was deposited by the side of the cutting. It amounted to 11,041.90 cubic yards.

The cut made was 5,560 feet in length, 20 feet in width, and to a depth of from 3 feet to 4 feet at low water, widening that much of the previous cutting to 60 feet.

The waterway is in the collection district of Beaufort, N. C.

For description of this waterway and previous operations see Annual Reports, 1892, pages 1141–1143; 1893, pages 1397, 1398; 1894, pages 1034, 1035; and 1896, pages 1117–1119.

Money statement.

July 1, 1896, balance unexpended	$6,399.09
June 30, 1897, amount expended during fiscal year	5,399.09
July 1, 1897, balance unexpended	1,000.00
Amount (estimated) required for completion of existing project	6,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	6,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886	$10,000	$10,000	July 13, 1892	$10,000	$40,000
August 11, 1888	5,000	15,000	August 17, 1894	2,500	42,500
September 19, 1890	15,000	30,000	June 3, 1896	1,000	43,500

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	375	Oysters	600
Cotton seed	271	Clams	2,000
Cotton-seed meal	12	Rosin	1,200
Rice	51	Turpentine, crude	1,300
Grains	190	Turpentine, spirits	310
Hay	150	Wood	1,900
Potatoes	400	Lumber	3,350
Vegetables	45	Shingles	50
Cattle	220	Fertilizers	1,050
Horses	5	Machinery	103
Hogs	150	General merchandise	3,000
Poultry	8	Coal	25
Eggs	7		
Fish	1,250	Total	18,022

Number of passengers, 1,100.

Decrease since last year, 3,852 tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1886	12,250	1893	32,633
1890	29,332	1894	Not given.
1891	30,240	1895	21,874

Statement of vessels navigating waterway between Beaufort Harbor and New River, North Carolina, during the calendar year ending December 31, 1896.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	2	110.52	3.5 to 4	176
Schooners and sloops	16	1,074.72	3 to 9	142
Flat	1	20	2.5	40

L 10.

IMPROVEMENT OF NEW RIVER, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report of the Chief of Engineers for 1896, page 1120.

There has been no work done on this river during the year and no expenditures except for maintenance of plant.

The river is in the collection district of Beaufort, N. C.

For description of this river and previous operations see Annual Reports, 1892, pages 1149–1150; 1893, pages 1400, 1402; 1894, pages 1037, 1039; 1895, pages 1328, 1330; and 1896, pages 1120, 1122.

The sum of $1,000 will be required annually for maintenance of this improvement.

Money statement.

July 1, 1896, balance unexpended	$4,069.37
June 30, 1897, amount expended during fiscal year	569.37
July 1, 1897, balance unexpended	3,500.00

Amount that can be profitably expended in fiscal year ending June 30, 1899: Present balance adequate for maintenance.
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838		$50,000	August 5, 1886	$10,000	$20,000
			August 11, 1888	3,000	23,000
August 2, 1882	$5,000	5,000	September 19, 1890	5,000	28,000
July 4, 1884	5,000	10,000	July 13, 1892	5,000	33,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	221	Rosin	1,505
Cotton seed	50	Turpentine, spirits	314
Rice	67½	Timber	3,000
Grains	103	Lumber	183
Hay	93	Shingles	9
Potatoes	7	Fertilizers	136
Vegetables	7	Machinery	8
Poultry	5	Coal	17
Eggs	3½	General merchandise	1,021
Fish	200		
Oysters	150	Total	7,209
Clams	50		

Number of passengers, 1,298.

Decrease since last year, 19,562¼ tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1889	5,000	1893	1,134½
1890	17,350	1894	1,147½
1891	23,333	1895	26,771½

Statement of vessels navigating New River, North Carolina, during the calendar year ending December 31, 1896.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	2	91.81	3	392
Schooners	2	37.20	3.6 to 4.5	24

Several small boats, whose tonnage and draft could not be obtained, ply irregularly on the river.

L 11.

IMPROVEMENT OF NORTH EAST (CAPE FEAR) RIVER, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects see Annual Report of the Chief of Engineers for 1896, page 1122.

Work during the year has been confined to snagging operations by the steam snag boat *H. G. Wright.*

The worst obstructions were removed from 45½ miles of the river, when operations were suspended on account of lack of funds.

The work has been under the local charge of Superintendent Charles Schuster, whose report is submitted herewith.

This river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1896, balance unexpended	$3,878.33
March 4, 1897, amount received from sale, to Cape Fear River at and below Wilmington	243.33
	4,121.66
June 30, 1897, amount expended during fiscal year	3,553.55
July 1, 1897, balance unexpended	568.11
Amount that can be profitably expended in fiscal year ending June 30, 1899, for maintenance	2,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriated.

September 19, 1890	$5,000
July 13, 1892	5,000
August 17, 1894	5,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	231½	Rosin	8,739
Cotton seed	31	Turpentine, crude	1,575
Cotton-seed meal	½	Turpentine, spirits	618
Tobacco	½	Wood	1,650
Rice	1	Timber	11,840
Grains	112	Lumber	20,020
Hay	5	Shingles	3,558
Potatoes	201	Fertilizers	30,960
Vegetables	5	Machinery	20
Cattle	195	Coal	40
Horses	100	Tar	70
Hogs	72	Bricks	4,000
Poultry	13	General merchandise	1,100
Eggs	4		
Fish	2	Total	85,166½

Gain over last year, 45,442½ tons. Transportation lines established during the year, one.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1890	40,506	1893	40,388
1891	30,295	1894	41,096
1892	37,429	1895	39,721

Statement of vessels navigating Cape Fear River, North Carolina (North East River), during the calendar year ending December 31, 1895.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamer	1	66.94	2
Steam tugs	7	135.98	2.5 to 8
Steam yacht	1	14.14	4.5
Flats	44	3,300	1.5 to 4

REPORT OF MR. CHARLES SCHUSTER, SUPERINTENDENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30, 1897.

CAPTAIN: I have the honor to submit the following report of operations on Cape Fear River, North Carolina (Northeast River), for the fiscal year ending June 30, 1897:

The work of improving this stream, prior to the fiscal year, consisted in snagging the channel from milepost 48 to milepost 100 in 1891, 1893, and 1894. From 1894 to 1896 no work was done. In 1896 the channel from milepost 100 to milepost 103 was cleared and the channel from milepost 100 to milepost 67 was resnagged.

During the past fiscal year the snag boat *H. G. Wright* was engaged in resnagging the channel from milepost 98½ to milepost 88, from July 1 to August 16, 1896, when snagging operations were suspended on this river and the steamer ordered to Upper Cape Fear River for jetty work.

Snagging was resumed at milepost 88 January 7, 1897, and continued to milepost 56 March 30, when work was suspended for lack of funds.

In addition to the above work the channel of the river from Hilton Bridge (at Wilmington) to a point 3 miles above it was cleared of snags and sunken logs.

In consequence of the work done on this river by the United States Government a steamboat line has been established during the past fiscal year, the boat making

semiweekly trips from Wilmington to Crooms Bridge, and weekly trips to Hallsville when the stage of the water permits.

To maintain the channel of the upper river in navigable condition will occupy the snag boat *H. G. Wright* at least three months in each year.

In addition to this, a deeper channel is required from Hilton Bridge to the third milepost.

Hilton Bridge is the northern limit of Wilmington Harbor, but for 3 miles above it large manufacturing establishments are located on the banks of the river.

The available depth through the channel immediately above the bridge is now only 15 feet at low water.

The available channel depth at low water was 6 feet to Bannermans Bridge, 0.5 foot to Hallsville, and +0.1 foot to Kornegays Bridge.

The following obstructions have been removed since the beginning of the improvement of this stream:

	1891–96.	1895–96.	1896–97.	Total.
From channel:				
Snags	2,782	659	1,576	5,017
Logs	1,655	7	145	1,807
Trees	.....	38	289	327
Stumps	.....	128	205	333
Wrecks	1	.....	.....	.....
From banks:				
Trees	735	.....	.....	735
Logs	26	.....	.....	26
Total	5,199	832	2,215	8,246

Very respectfully, your obedient servant,

CHAS. SCHUSTER, *Superintendent.*

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 12.

IMPROVEMENT OF BLACK RIVER, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects, see Annual Report Chief of Engineers for 1896, page 1125.

Owing to the limited amount of money available, work was necessarily confined to the worst obstructed places. The snag boat *H. G. Wright* was engaged upon this from April 8 to May 7, 1897.

The shoal at Hawes Narrows was improved at small expense by choking two sloughs with brush and logs.

This river has been under the immediate charge of Mr. Charles Schuster, superintendent, extracts from whose report is submitted herewith.

This river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1896, balance unexpended	$1,337.12
March 4, 1897, amount received from sale to Cape Fear River, N. C., at and below Wilmington	243.34
	1,580.46
June 30, 1897, amount expended during fiscal year	809.63
July 1, 1897, balance unexpended	770.83
July 1, 1897, outstanding liabilities	2.50
July 1, 1897, balance available	768.33
Amount that can be profitably expended in fiscal year ending June 30, 1899, for maintenance	2,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886	$3,000	$3,000	August 17, 1894	$2,000	$15,000
July 13, 1892	10,000	13,000	June 3, 1896	1,000	16,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	353	Rosin	3,364
Cotton-seed oil	2½	Turpentine, crude	137
Cotton-seed meal	14	Turpentine, spirits	686
Rice	3	Wood	7,000
Grains	16	Timber	21,300
Hay	5½	Lumber	23,300
Potatoes	7	Shingles	661½
Cattle	125	Fertilizers	200
Horses	12	Machinery	10
Hogs	65	Tar	507
Poultry	16	General merchandise	11,247
Eggs	1½		
Fish	½	Total	69,033½

Number of passengers, 600.

Gain over last year, 5,771½ tons. Transportation lines established during the year, one.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1885	48,650	1893	45,003
1890	61,311	1894	41,130½
1891	79,429	1895	63,262
1892	56,051		

Statement of vessels navigating Black River, North Carolina, during the calendar year ending December 31, 1895.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	4	180.72	3.0 to 3.5	162
Steam tugs	4	47.75	3.5 to 4.5	(a)
Flats	38	2,750.00	1.5 to 4.0	(a)

a Unknown.

REPORT OF MR. CHARLES SCHUSTER, SUPERINTENDENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30, 1897.

CAPTAIN: I have the honor to submit the following report of operations for the improvement of Black River, North Carolina, for the fiscal year ending June 30, 1897:

At the beginning of the fiscal year the channel of the river was badly obstructed by snags and overhanging trees, particularly below milepost 47, no work having been done on this part of the river since December, 1894.

Owing to the limited amount of money available, the work of maintaining the channel was confined to the worst obstructed places in the river, the steamer *H. G. Wright* being engaged on this work from April 8 to May 7, 1897, removing from the channel 76 stumps, 71 logs, 393 snags, and 85 trees.

An experiment was made of choking two of the worst outlet sloughs at Hawes Narrows with bundles of brush and loading the brush down with snags and logs.

The brush soon silted up, closing the slough effectively, and the augmented current in the river has scoured the shoal below sufficiently for present purposes of navigation.

At the end of the fiscal year many obstructions remained in the channel.

* * * * * * *

A more thorough clearing of this stream is needed annually to maintain the channel in navigable condition.

* * * * * * *

Very respectfully, your obedient servant,

CHAS. SCHUSTER, *Superintendent.*

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 13.

IMPROVEMENT OF CAPE FEAR RIVER ABOVE WILMINGTON, NORTH CAROLINA.

For previous history of this improvement and detailed statements of projects, see Annual Report of Chief of Engineers for 1896, page 1128.

Work has been carried on by use of United States plant and hired labor.

During the year the most troublesome shoals, which were at McDowells Barn, Elizabethtown, Little Sugar Loaf, and Walkers Bluff, have been improved by regulating works of piles and brush. These works have cost at the rate of $2.12 per linear foot.

The steam snag boat *H. G. Wright* has made several trips over the river to remove the worst obstructions, and at the end of the year is working regularly in the river.

This work has been under the immediate charge of Superintendent Charles Schuster, extract from whose report is inclosed herewith.

This river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1896, balance unexpended		$8,258.87
March 4, 1887, amount received from sale to Cape Fear River, at and below Wilmington		243.33
April 30, 1897, amount received from sale to torpedoes for harbor defense.		171.00
		8,673.20
June 30, 1897, amount expended during fiscal year		4,241.74
July 1, 1897, balance unexpended		4,431.46
July 1, 1897, outstanding liabilities		687.05
July 1, 1897, balance available		3,744.41
Amount (estimated) required for completion of existing project		*137,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		18,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881	$30,000	$30,000	September 19, 1890	$15,000	$103,250
August 2, 1882	30,000	60,000	July 13, 1892	15,000	118,250
July 5, 1884	5,000	65,000	August 17, 1894	14,000	132,250
August 5, 1886	11,250	76,250	June 3, 1896	5,000	137,250
August 11, 1888	12,000	88,250			

* Three thousand dollars annually for cost of maintenance and snagging not included.

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	1,464	Rosin	3,442
Cotton seed	7	Turpentine, crude	255
Cotton-seed oil	40	Turpentine, spirits	278
Cotton-seed meal	5	Tar	1,253
Rice	3	Wood	21,700
Grains	22	Timber	5,300
Hay	17	Lumber	26,091
Potatoes	10	Shingles	1,736
Vegetables	½	Fertilizers	15,567
Cattle	120	Machinery	4
Horses	75	Coal	2
Hogs	60	General merchandise	22,240
Poultry	30		
Eggs	1	Total	99,357½

Number of passenger, 1,200.

Decrease since last year, 4,369½ tons. Transportation lines established during the year, 1.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1889	50,000	1893	92,757
1890	129,000	1894	85,497
1891	88,638	1895	103,727
1892	72,810		

Statement of vessels navigating Cape Fear River, North Carolina, above Wilmington, during the calendar year ending December 31, 1896.

Class of vessels.	No.	Aggregate net tonnage.	Draft.	Trips during the year.
			Feet.	
Steamers	7	702.92	3.0 to 4.5	572
Steam tugs	7	88.70	3.5 to 7.5	(a)
Steam yachts	2	18.14	4.5	(a)

a Unknown.

REPORT OF MR. CHARLES SCHUSTER, SUPERINTENDENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 1, 1897.

CAPTAIN: I have the honor to submit the following report on Cape Fear River, North Carolina, above Wilmington, for the fiscal year ending June 30, 1897:

At the beginning of the present fiscal year the river was badly obstructed by sunken logs and snags from Fayetteville to Kellys Cove, a distance of 71 miles.

The worst shoals then existing were: McDowells Bar, 77 miles above Wilmington, on which the channel depth was 1.8 feet; Elizabethtown Shoal, 73½ miles above Wilmington, with a depth of 2.7 feet; Little Sugar Loaf Shoal, 65 miles above Wilmington, with 3 feet, and Walkers Bluff Shoal, 60 miles above Wilmington, with 2.9 feet.

During the present fiscal year the above shoals were improved by jetties of piles and brush, the piles being driven in a double row 4 feet apart each way. The space between the rows of piles was filled with brush fascines to a height of about 2 feet above low water, the brush being compressed with the piledriving hammer and secured by cross binders spiked to the piles. The outside row of piles was stayed by a course of waling pieces of pine 6 by 8 inches, secured to the piles by three-quarter-inch screwbolts.

The cost of constructing these jetties was $2.12 per linear foot. This includes towage, preparing, repairing, and maintaining plant, cost of material, superintendence, delays by high water, and all expenses properly chargeable to the jetty work.

The eight jetties built were located at four different shoals, scattered over a distance of 17 miles of river and involving an abnormal amount of towing and transfer of plant; hence the high cost.

No resurveys have been made of these shoals since the jetties were built to determine the exact effect of these jetties on the shoals, but river pilots report the shoals as greatly improved.

Several trips have been made over the river by the snag boat *H. G. Wright* to remove the most dangerous obstructions from the channel, but owing to the lack of funds no regular and continuous snagging was done during the fiscal year.

* * * * * * *

Very respectfully, your obedient servant,

CHAS. SCHUSTER, *Superintendent.*

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 14.

IMPROVEMENT OF CAPE FEAR RIVER, NORTH CAROLINA, AT AND BELOW WILMINGTON.

For previous history of this improvement and detailed statements of projects see Annual Report, Chief of Engineers, for 1896, page 1131.

The work of the past fiscal year has been carried on by hired labor and use of the United States plant. It has consisted in extending and repairing the training dike at Snows Marsh, repairing New Inlet Dam, and in operating the suction dredge *Cape Fear*. A dredging plant was purchased and started to work in the river. It consisted of a clam-shell dredge with bucket of 6 cubic yards' capacity, a tugboat, and dump scow. Another dump scow was built and most of the material purchased for a third one.

The repairs to the end of New Inlet Dam, which were in progress at the beginning of the year, were completed on April 17, 1897. For this purpose a structure 785 feet long of rock and sand bags on a brush mattress 90 feet wide was used. Since its completion, sand has begun to accumulate on both sides of it.

The training dike at Snows Marsh was extended 228 feet at the upper end and 496 feet at the lower end. The extension consisted of a row of piles driven in juxtaposition. The dike was repaired several times during the year, by replenishing and better securing the brush between the piles. Finally, it was determined to abandon this character of work, as too expensive and difficult to maintain in deep water, when exposed to the waves and to the teredo. Thereafter repairs were made by driving a row of piles close together on the west side of the dike. A length of 2,470 feet of the upper portion of the dike was repaired in this way.

The suction dredge *Cape Fear* has been at work in the Bar Channel when weather permitted and at other times at Snows Marsh and Reaves Point, the shoals nearest the mouth of the river.

She has excavated 463,173 cubic yards, at a total cost of $22,276.60.

The clam-shell dredging plant commenced work on April 20 at Lilliput Shoal. Before the end of the year there had been excavated 87,351 cubic yards of mud and sand, 25 stumps, and 1 log from this shoal. The cost has been 7.4 cents per cubic yard, engineering not included.

The work on the river has been under the immediate charge of Assistant Engineer Charles Humphreys, to whom much credit is due for the excellent results obtained. His report is submitted herewith.

Wilmington is a port of entry.

Money statement.

July 1, 1896, balance unexpended	$272,523.21
March 4, 1897, amount received from sale to other appropriations	100.00
May 31, 1897, amount received from rent of scow	15.00
	272,638.21
June 30, 1897, amount expended during fiscal year	99,524.20
July 1, 1897, balance unexpended	173,114.01
July 1, 1897, outstanding liabilities	4,867.47
July 1, 1897, balance available	168,246.54
Amount (estimated) required for completion of existing project	*1,035,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	225,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 2, 1829, to July 22, 1854		a $363,228.92	June 14, 1880	$70,000	$1,137,500.00
			March 3, 1881	140,000	1,277,500.00
July 11, 1870	$100,000	100,000.00	August 2, 1882	225,000	1,502,500.00
March 3, 1871	75,000	175,000.00	July 5, 1884	200,000	1,702,500.00
June 10, 1872	100,000	275,000.00	August 5, 1886	157,500	1,860,000.00
March 3, 1873	100,000	375,000.00	August 11, 1888	245,000	2,105,000.00
June 23, 1874	150,000	525,000.00	September 19, 1890	170,000	2,275,000.00
March 3, 1875	150,000	675,000.00	July 13, 1892	200,000	2,475,000.00
August 14, 1876	132,500	807,500.00	August 17, 1894	200,000	2,675,000.00
June 18, 1878	160,000	967,500.00	June 3, 1896	195,000	2,870,000.00
March 3, 1879	100,000	1,067,500.00			

a Balance of $3,728.07 turned over to surplus fund.

Abstract of proposals for dredging plant, etc., for use on work of improving Cape Fear River, North Carolina, at and below Wilmington, opened at 2 o'clock p. m., November 2, 1896, by Lieut. Col. D. P. Heap, Corps of Engineers, at Wilmington, N. C.

No.	Name and address of bidder.	Item 1, one clam-shell dredge.	Item 2, one bottom dump scow.	Item 3, one tug-boat.	Aggregate bid.	Machinery, etc., in lieu of item 1.	Remarks.
1	E. J. Codd Co., Baltimore, Md.	$28,993	$5,900	$15,943	$45,733	$14,000	New plant.
2	John H. Dialogue, Camden, N. J.	.....	.....	18,000	.....	.....	Do.
3	Napie & Levy S. & E. Building Co., Philadelphia, Pa.	.....	.....	15,000	.....	.....	Do.
4	Chas. Hillman S. & E. Building Co., Philadelphia, Pa.	.....	.....	18,550	.....	.....	Do.
5	D. M. Molyneux, Bordentown, N. J.	.....	.....	17,500 15,500	.....	.....	Surface condenser; keel condenser; old plant.
6	Bucyrus Steam S. & D. Co., South Milwaukee, Wis.	.....	.....	.....	.....	19,000	New plant.
7	C. F. Towing and Transportation Co., Southport, N. C.	.....	.....	11,000	.....	.....	Old plant.
8	Cordes & Bochman, Charleston, S. C.	16,050	3,000	8,500	27,550	.....	Do.
9	Petersburg Iron Works, Petersburg, Va.	29,575	4,500	4,800	38,275	16,900	New plant, except last item (3).
10	Wilmington Iron Works, Wilmington, N. C.	36,750	6,000	.....	.....	19,750	New plant.

Award was made to bidder No. 8, Cordes & Bochman, at aggregate of $27,550.

*Twenty-five thousand dollars annually for cost of maintenance where project depth and width has been obtained not included.

COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1896.

Exports, foreign and coastwise.

[Furnished by Col. J. L. Cantwell, secretary of the Wilmington Produce Exchange.]

	Tons.
Cotton	62,672
Lumber	67,397
Shingles	2,235
Rosin	31,707
Tar	5,037
Turpentine, spirits	7,335
Turpentine, crude	283
Pitch	374
Miscellaneous, estimated	85,000
Total	262,040

Exports, internal.

[Furnished by steamboat, flat, and raft men.]

Miscellaneous	51,350
Total of exports, foreign, coastwise, and internal	313,390

Imports, foreign and coastwise.

[Furnished by importers and manufacturers.]

Fertilizers	41,200
Coal	13,010
Salt	6,300
Oil	6,002
Rice	1,320
Miscellaneous (naval stores, cotton, and general merchandise)	130,144
Total	197,976

Imports, internal.

[Furnished by steamboat, flat, and raft men.]

Cotton	1,601
Tar	2,535
Turpentine, spirits	1,843
Turpentine, crude	408
Rosin	12,009
Lumber and timber	107,851
Shingles	5,595
Wood	20,000
Miscellaneous	10,000
Total	161,842
Total of imports, foreign, coastwise, and internal	359,818

SUMMARY.

Exports:	
Foreign and coastwise	262,040
Internal	51,350
Imports:	
Foreign and coastwise	197,976
Internal	161,842
Total	673,208

Gain over last year, 55,154 tons.

Foreign commerce for the year 1896.

[Furnished by Mr. W. R. Kenan, collector of customs.]

Class of goods.	Quantity.	Value.	
		Exports.	Imports.
Cotton ..... bales..	243,558	$8,079,702	.....
Rosin ..... barrels..	183,456	314,930	.....
Tar ..... do....	6,600	9,525	.....
Pitch ..... do....	914	1,566	.....
Turpentine, spirits ..... gallons..	139,808	44,134	.....
Lumber ..... M feet..	13,529	168,015	.....
Shingles ..... M..	3,551	18,881	.....
Miscellaneous	.....	5,534	$152,378
Total	.....	8,632,287	152,378

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1888	220,000	1892	341,468
1889	325,512	1893	392,965
1890	346,557	1894	437,623
1891	344,743	1895	618,054

Cotton steamers loaded at the port of Wilmington, N. C., during the calendar year ending December 31, 1896.

[Furnished by Messrs. Alex. Sprunt & Son and Mr. J. H. Sloan.]

Name of steamer.	Registered tonnage.	Draft, loaded.	Bales.	Pounds.
Loaded by A. Sprunt & Son:		*Feet. In.*		
Graffoe	1,922	18	10,323	5,004,488
Royalist	2,024	17 6	11,014	5,323,531
Fruters	637	15	2,765	1,330,031
Naparima	1,043	15 6	4,907	2,371,998
Titanic	1,024	15 8	4,150	2,000,217
Sandhill	1,335	16 6	6,357	3,178,744
Thurston	1,177	16 7	5,715	2,851,120
Ormsby	1,828	18	9,216	4,616,967
Glenmavis	1,353	18 3	6,119	3,045,993
Carlton	2,005	19 2	9,583	4,785,571
Ceylon	1,443	17 2	6,712	3,334,772
Crathorne	1,695	17	8,161	4,033,806
Dulwick	2,111	18 9	10,573	5,212,441
Ormidale	2,305	19 6	11,739	5,802,608
Lobelia	1,913	18	9,315	4,552,672
Magdala	2,297	18 6	11,740	5,692,770
Leven	1,507	18 8	7,300	3,535,908
Wraggoe	1,838	17 6	9,950	4,800,655
Janeta	2,179	18 5	11,396	5,505,050
Corinthia	837	17 3	3,860	1,885,928
Naranja	658	15 6	2,675	1,284,607
Roxby	1,964	18 4	9,982	4,819,829
Malthy	1,808	17 6	9,200	4,415,904
Loaded by J. H. Sloan:				
Rydal Holme	1,226	.....	6,150	2,967,670
Madeline	1,862	.....	9,500	4,664,602
Sheernes	1,413	.....	6,980	3,374,700
Lief Eriksson	1,340	.....	6,406	3,104,435
Total	42,744	.....	211,788	103,527,167

Statement of vessels of 100 tons and over at the port of Wilmington, N. C., for the calendar year ending December 31, 1896.

[Furnished by Col. J. L. Cantwell, secretary of the Wilmington Produce Exchange.]

Class of vessels.	American.		Foreign.		Total.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Steamers	137	126,529	33	51,701	170	178,230
Barks	4	1,725	41	21,765	45	23,490
Brigs	6	1,921	4	782	10	2,703
Schooners	123	32,752	15	2,853	138	35,605
Barges	15	7,825	.....	.....	15	7,825
Total	285	170,752	93	77,101	378	247,853

The above does not include vessels owned by the United States Government and vessels coming into Southport for coal or for harbor, the total estimated tonnage of which is 8,000. No record is made of steamboats plying on the river above Wilmington, or of small vessels of less than 100 tons.

Statement of vessels plying on the Cape Fear River, North Carolina, at and below Wilmington, during the calendar year ending December 31, 1896.

[This statement is in addition to that furnished by Colonel Cantwell.]

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	9	751.48	2.5 to 6.5
Steam tugs	11	318.19	3.5 to 10
Steam yachts	5	25.64	2 to 4.5

The Standard Oil Company has made Wilmington a distributing point, and receives its oil in bulk by tank vessels from Philadelphia. One other transportation line was established during the year.

REPORT OF MR. CHARLES HUMPHREYS, ASSISTANT ENGINEER.

WILMINGTON, N. C., *June 30, 1897.*

CAPTAIN: I have the honor to submit the following report of operations for the improvement of the Cape Fear River, North Carolina, at and below Wilmington, for the fiscal year ending June 30, 1897:

* * * * * * *

The operations for the year have principally consisted of the work of the suction dredge *Cape Fear* on the Ocean Bar, Snows Marsh Channel, and Reaves Point, extending and repairing the training dike at Snows Marsh, repairing New Inlet Dam, purchasing dredging plant and fitting up and operating the same, building dump scow, concreting triangulation points, making minor surveys, and repairing and watching plant.

The suction dredge *Cape Fear* has been employed on the bar channel when weather permitted, and at other times at Snows Marsh and Reaves Point channels. On July 29 a trial was made with the boat at Reaves Point, Midnight, and Old Brunswick Cove shoals. At Reaves Point Shoal a large percentage of material is sand, and she did very well; but at Midnight and Old Brunswick Cove shoals the material is principally mud, and the suction pipes were continually choking, and most of the material pumped into the bins passed off at overflows. She has worked in deeper water this year, the material containing a larger percentage of mud, which passed out at overflows. The occasional picking up of pieces of iron, old cannon ball, etc., by the drags, and their passing through the pumps, have at times caused breaks to pumps and other machinery.

The amount of work done and the cost of same may be summarized as follows:

	Total.	Bar.	Snows Marsh.	Reaves Point.	Midnight.	Old Brunswick Cove.
Days of actual work	261.3	146⅔	105½	9	⅓	⅓
Cubic yards of sand removed	463,173	294,630	155,510	12,899	67	67
Cost of operating, labor	$10,002.25	$5,617.12	$4,028.64	$344.49	$6.00	$6.00
Coal and wood ($1,280 on hand at first of year)	4,400.27	2,471.28	1,772.41	151.58	2.50	2.50
Oil and engine supplies ($436.40 of this on hand at first of year)	852.21	478.40	343.11	29.70	.50	.50
Minor repairs ($700 of this on hand at first of year)	2,882.62	1,620.12	1,161.96	98.04	1.25	1.25
Property, rope, etc. ($93.60 on hand at first of year)	310.69	174.63	125.25	10.31	.25	.25
Special repairs	40.00	22.01	15.79	2.20	.....	.....
Total	18,488.04	10,383.56	7,447.16	636.32	10.50	10.50
Cost per cubic yard, operating expenses	.04—	.03½+	.04 3/10—	.04 3/10+	.15 7/10—	.15 7/10—
Other expenses chargeable to the work:						
Superintendence	2,149.93	1,207.75	866.21	73.97	1.00	1.00
Surveys and concreting triangulation points	606.06	340.46	244.18	21.42	.....	.....
Ranges	180.09	101.26	72.62	6.21	.....	.....
Use of steamer Easton	517.15	290.56	208.40	17.69	.25	.25
Repairing storehouse at Southport	48.73	27.88	20.00	.85	.....	.....
Dragging for anchor	26.64	.....	26.64	.....	.....	.....
Watching, rent, repairs to house, etc., at Wilmington	259.96	146.00	105.00	8.46	.25	.25
Total	3,788.56	2,113.91	1,543.05	128.60	1.50	1.50
Total cost of operating and other expenses	22,276.60	12,497.47	8,990.21	764.92	12.00	12.00
Total cost per yard	.04 8/10+	.04 2/10+	.05 8/10—	.05 8/10+	.17 8/10+	.17 8/10+

The following supplies and duplicate machinery are now on hand, and have not been charged into the cost of work:

Coal	$583.95
Duplicate machinery	1,173.00
Engine supplies	302.51
Total	2,059.46

The steamer *Cape Fear* has dug since built and delivered June 8, 1895, 969,898 cubic yards, the total cost of which has been as follows:

Total cost of boat delivered at Southport, N. C		$60,809.30
Coal dock built at Southport, N. C		4,480.64
Cost of operating June 10 to 30, 1895		1,580.75
Other expenses, superintendence, wharf rent at Wilmington, etc., June 10 to 30, 1895		99.74
Cost of operating July 1, 1895, to June 30, 1896		17,052.06
Other expenses, superintendence, wharf rent at Wilmington, etc		5,382.88
Cost of operation July 1, 1896, to June 30, 1897		18,488.04
Other expenses, superintendence, wharf rent at Wilmington, etc		3,788.56
Total		111,681.97
Less present value—		
Of boat	$50,000.00	
Of wharf	3,800.00	
		53,800.00
Total cost, including all expenses, deterioration, etc		57,881.97
Cost of operating boat per cubic yard		.03 8/10
Total cost, including all expenses, deterioration, etc., per cubic yard		.06—

The repairs to Federal Point end of New Inlet Dam in progress June 30, 1896, were continued to April 17, 1897, when they were completed. The repairs have consisted of placing rock and sand bags on a brush mattress 90 feet wide and 785 feet long;

5,223 sand bags, 2,732.61 tons rubblestone, 504.4 cords of brush fascines, and 210 poles were used. This material was towed from Wilmington on United States lighters by United States tugs and unloaded by placing the lighters ashore, and then wheeled and carried about 1,000 feet to the site by manual labor. Since the completion of repairs, April 17, 1897, the water on the sea and river sides has shoaled considerably by the deposit of sand.

Approximate itemized cost:

Labor	$5,191.42
Poles, 210	63.00
Brush fascines, 504.4 cords	1,236.54
Rope in mattresses	13.13
Stone, 2,732.61 tons	3,324.53
Minor repairs to steamer *Easton*	129.16
Repairs to scows	275.00
Minor repairs to hoister	5.15
Oil and engine supplies	18.90
Coal	606.50
Superintendence	538.17
New hoisting engine and hull (part)	150.00
Watching, rent and repairing wharf at Wilmington (part)	200.00
Total	11,751.50

From July 1 to 24 the training dike at Snows Marsh was extended 228 feet up the river and 496 feet down the river, making the total extension 724 feet. The extension consists of a single row of piles driven as close together as possible, no brush being used.

Approximate itemized cost.

654 piles, long-leaf yellow pine, 45 feet long, 8 inches at point		$1,066.40
Driving:		
Labor	$291.60	
Oil, etc	4.00	
Coal and wood	30.66	
Superintendence	42.20	
New hoisting engine and hull (part)	25.00	
		393.46
Towing:		
Labor	149.03	
Coal and wood	60.00	
Minor repairs to *Easton*	14.00	
Oil, etc	6.89	
Superintendence	30.00	
Watching, rent, and repairing wharf at Wilmington (part)	25.00	
		284.92
Total		1,744.78
Cost per linear foot		2.41

The total length of dike to June 30, 1897, is, 9,964 feet.

On July 31 the repairs to the training dike in progress June 30, 1896, were completed, the brush having been secured in 6,393 linear feet by cross binders.

Approximate itemized cost.

Labor	$243.07
Coal	45.00
Oil and machine supplies	9.50
Minor repairs to *Easton* and hoister	32.58
Superintendence	43.33
Watching, rent, and repairing wharf at Wilmington (part)	25.00
New hoisting engine and hull (part)	25.00
Total	423.48

From October 15 to November 10 the pile and brush portion of the dike was repaired by removing the cross binders and replenishing the brush and driving new piles where needed. This brush was purchased on the stump at 15 cents per cord, cut and bundled by hired labor.

Approximate itemized cost.

Piles, 4	$4.00	
Brush fascines, 318 cords	47.70	
Labor, cutting, bundling, and hauling	383.51	
Wire (on hand at first of year)	100.00	
		$535.21
Loading and putting in dike:		
Labor	200.67	
Coal	30.00	
Repairs to hoister	6.15	
Supplies	8.72	
Property, rope, etc	21.02	
New hoisting engine and hull (part)	50.00	
Watching, rent, and repairing wharf at Wilmington (part)	50.00	
		366.56
Towing:		
Labor	136.00	
Coal	100.00	
Repairs to *Easton* and *Cynthia*	11.16	
Watching, rent, and repairing wharf at Wilmington (part)	85.00	
		332.16
Total		1,233.93

From January 28 to March 29 2,470 feet of the upper end of the pile and brush portion of the dike was repaired. The repairs consisted of a single row of piles driven as close together as possible along the west side of the dike. It was found to be too expensive to keep up repairs with brush fascines on account of the increased depth of water and the difficulty of retaining the brush in the dike during storms.

Approximate itemized cost.

Piles, 2,040 long-leaf yellow pine, 45 feet long, 8 inches at point		$2,754.00
Towing:		
Labor	$537.94	
Oil and machine supplies	3.62	
Minor repairs to *Easton* and *Cynthia*	3.77	
Repairs to scows	175.00	
Superintendence	60.00	
Coal	260.00	
Rent, watching, and repairing wharf at Wilmington (part)	106.60	
		1,146.93
Driving:		
Labor	947.31	
Repairs to hoister	114.54	
Superintendence	81.60	
Coal	40.00	
Blocks (on hand at first of year)	150.00	
New hull and hoisting engine (part)	50.00	
		1,383.45
Total		5,284.38
Cost per linear foot		2.14—

The following plant is on hand and has not been charged into the cost of work:

Hoister, hull, and engine	$980.00

After advertising thirty days a second-hand dredging plant was purchased, consisting of a clam-shell dredge with hull 82 feet 6 inches by 32 feet 6 inches by 9 feet 3 inches; one tugboat, steeple compound engine 10 inches and 20 by 18 inches, surface condensing, allowed 125 pounds of steam, net tonnage 29.35; and one dump scow 80 by 24 by 9 feet, capacity 244 cubic yards.

The plant was towed to Cape Fear River and subjected to a trial from December 7 to 31. The trial was deemed satisfactory, and the plant purchased January 1, 1897.

The prices paid were as follows:

One clam-shell dredge *Ajax*	$16,050 00
One tugboat *Cynthia*	8,500.00
One dump scow *B*	3,000.00
	27,550.00

After purchasing this plant and before putting it to work repairs and improvements were made to the dredge and dump scow as follows:

Special repairs, improvements, and outfit to dredge Ajax.

	Material.	Labor.	Total.
Total	$3,845.18	$1,325.37	$5,170.55
Special repairs to dump scow			200.00

One new dump scow has been built and part of the material purchased for a second dump scow and probable necessary repairs to dredge, scows, and tugboats. The scow built is 84 feet 8 inches by 26 feet by 10 feet 3 inches, capacity 278 cubic yards.

The amount spent for the two scows, etc., is as follows:

Travel expense and meals	$23.35	
Labor	3,923.83	
Hewn timber	1,660.00	
Iron, oakum, spikes, and turpentine	572.05	
Blocks	30.50	
Tools	103.06	
Lumber	2,121.85	
Turn-buckles, etc	361.68	
Tallow	7.50	
Knees	66.40	
Hinges and shafting	531.18	
Cleats, etc	179.41	
		$9,580.81
Less material used in spud well for *Ajax*	100.00	
Less material used in repairing old dump scow	110.00	
Less material for two spuds for *Ajax*	50.00	
Less material on hand June 30	2,940.81	
		3,200.81
Total cost of new scow		6,380.00

The dredge during her trial December 7 to 31 dug from Lilliput Shoal 5,002 cubic yards of material and 9 stumps, and from channel to dump ground at Lilliput Shoal 6,954 cubic yards of hard sand. Between January 1 and April 19 the dredge and scow were thoroughly overhauled. During the same time the tug *Cynthia* was used to tow rock, brush, and piles to New Inlet Dam and Snows Marsh Dike.

The dredge began work at Lilliput with one scow and the *Cynthia* April 20, and worked to May 14, when she was towed to Wilmington to put in a new spud well. The work was completed and she resumed work at Lilliput Shoal May 29, working with only one scow until June 3, when she was given a second scow, and has continued working with two scows to date. She has removed from Lilliput Shoal since April 20 82,349 cubic yards of material, 16 stumps, and 1 log, making a total during the fiscal year of 87,351 cubic yards, 25 stumps, and 1 log removed from Lilliput Shoal and the remaining 6,954 cubic yards from channel to dump ground at that shoal.

The dredge has worked satisfactorily during the month of June, with the exception of breakages to bucket, chains, frictions, spuds, and main pinion. New friction blocks have been made and were put in on June 21, and since that time have worked well. New chain, new 4-yard sand bucket, and oak spud have been ordered, and will be delivered in July. The present bucket, 6 cubic yards capacity in soft mud, will dig about 10 cubic yards, too much for the machine to hoist; but in hard sand will sometimes get only about a peck. Notwithstanding these disadvantages the machine dug during June 50,351 cubic yards of material, 3 stumps, and 1 log, which at the last contract prices, 12.44 cents per cubic yard, $25 for stumps, and $15 for logs, amounts to $6,353.66. These stumps were left by the last contractor on account of their being too large for his machine to pull.

The operating expenses of dredge and tug for the month of June, including a new set of friction blocks and new main pinion, which will probably last for several months, have been $2,329.58, making her clear gain exclusive of cost of plant, $4,024.08.

During June the dredge worked 171¼ hours, making an average of 293 + cubic yards per hour, and lost 105¼ hours making repairs. Average length of tow to dump ground 2 miles.

The following is an approximate itemized cost of work done by her during the year:

Plant:		
First cost of dredge *Ajax*	$16,050.00	
Examination of plants offered for sale (traveling expenses, etc.)	170.92	
Special repairs to *Ajax* (see table)	5,170.55	
New spud well to *Ajax*	957.02	
Steamer *Cynthia*	8,500.00	
Scow purchased	3,000.00	
Repairs to scow purchased	200.00	
Scow built	6,380.00	
Repairs to deck scows (water tank, coal bins, etc.)	400.00	
Material on hand for second scow, etc	2,940.81	
		$43,769.30
Operating dredge *Ajax:*		
Labor	1,944.93	
Coal	629.65	
Rope, property, etc	553.67	
Minor repairs	1,199.65	
Oil and machine supplies	239.43	
		4,567.33
Operating tugs:		
Labor	1,560.70	
Coal	439.05	
Minor repairs	663.22	
Oil and machine supplies	66.99	
Property, rope, etc	87.00	
		2,816.96
Repairs to scow:		
Lumber	110.00	
Labor	124.07	
Oakum, etc	16.71	
		250.78
Total		51,404.37
Less present value of plant:		
Dredge *Ajax*, purchase and repairs	22,348.51	
Steamer *Cynthia*	8,500.00	
Scow *B*, purchase and repairs	3,200.00	
Scow built, *A*	6,380.00	
Water tanks and coal bins on deck scows	400.00	
Material on hand for second scow, etc	2,940.81	
		43,769.30
Cost of operation		7,635.07

Cost of operation per cubic yard, allowing $25 per stump and $15 per log, is as follows:

25 stumps, at $25	$625.00	
1 log, at $15	15.00	
		$640.00
Balance		6,995.07

Divided by 94,305 cubic yards, equals 7.4 cents per cubic yard.

Other expenses chargeable to work:		
Superintendence	489.13	
Watching, rent, repairs to wharf at Wilmington	182.67	
Ranges	29.71	
Concreting triangulation points	100.00	
		801.51
Total cost per cubic yard, 8.3 cents, including operating, superintendence, etc		7,796.58

The following supplies are on hand and have not been charged into the cost of this work:

Four dipper poles	$60.00
Oil and machine supplies	271.11
Total	331.11

The following amounts were spent for ranges, surveys, and concreting triangulation points at the following shoals:

Reaves Point Shoal:		
Dredge ranges, concreting triangulation points, etc		$131.36
Midnight Shoal:		
Dredge ranges	$100.00	
Concreting triangulation points	19.44	
		119.44
Old Brunswick Cove Shoal:		
Dredge ranges	11.64	
Concreting triangulation points	61.86	
		73.50
Keg Island Shoal:		
Concreting triangulation points		50.00
Logs and Big Island Shoal:		
Concreting triangulation points		100.00
Brunswick River Shoal:		
Concreting triangulation points		56.50
Total		530.80
Expended in connection with the main office		893.50
Condenser for steamer *Easton* on hand and not charged into cost of work		1,101.50

Distribution of expenditures.

Ocean Bar:		
Operating steamer *Cape Fear* (see table)	$12,497.47	
Repairs to New Inlet Dam	11,751.50	
		24,248.97
Snows Marsh Channel:		
Operating steamer *Cape Fear* (see table)	8,990.21	
Extending training dike	1,744.78	
Repairing training dike	6,941.79	
		17,676.78
Reaves Point Shoal:		
Operating steamer *Cape Fear* (see table)	764.92	
Dredge ranges and concreting triangulation points	131.36	
		896.28
Midnight Shoal:		
Operating steamer *Cape Fear* (see table)	12.00	
Dredge ranges and concreting triangulation points	119.44	
		131.44
Old Brunswick Cove Shoal:		
Operating steamer *Cape Fear* (see table)	12.00	
Dredge ranges and concreting triangulation points	73.50	85.50
Lilliput Shoal:		
Operating dredge, including dredge ranges and concreting triangulation points (see table)		8,436.58
Keg Island Shoal:		
Concreting triangulation points		50.00
Logs and Big Island Shoal:		
Concreting triangulation points		100.00
Brunswick River Shoal:		
Concreting triangulation points		56.50
Main office expenses		893.50
Total		52,575.55
Add plant, supplies, and on hand July 1, 1897:		
Duplicate machinery supplies, etc., steamer *Cape Fear*	$2,059.46	
Plant on hand, dike repairs	980.00	
Dredging plant, *Ajax*, *Cynthia*, etc	43,769.30	
Supplies, etc., for *Ajax*	331.11	
Condenser for steamer *Easton*	1,101.50	
		48,241.37
Total		100,816.92
Deduct supplies, duplicate machinery on hand July 1, 1897		2,760.00
Expenditures for the year		98,056.92

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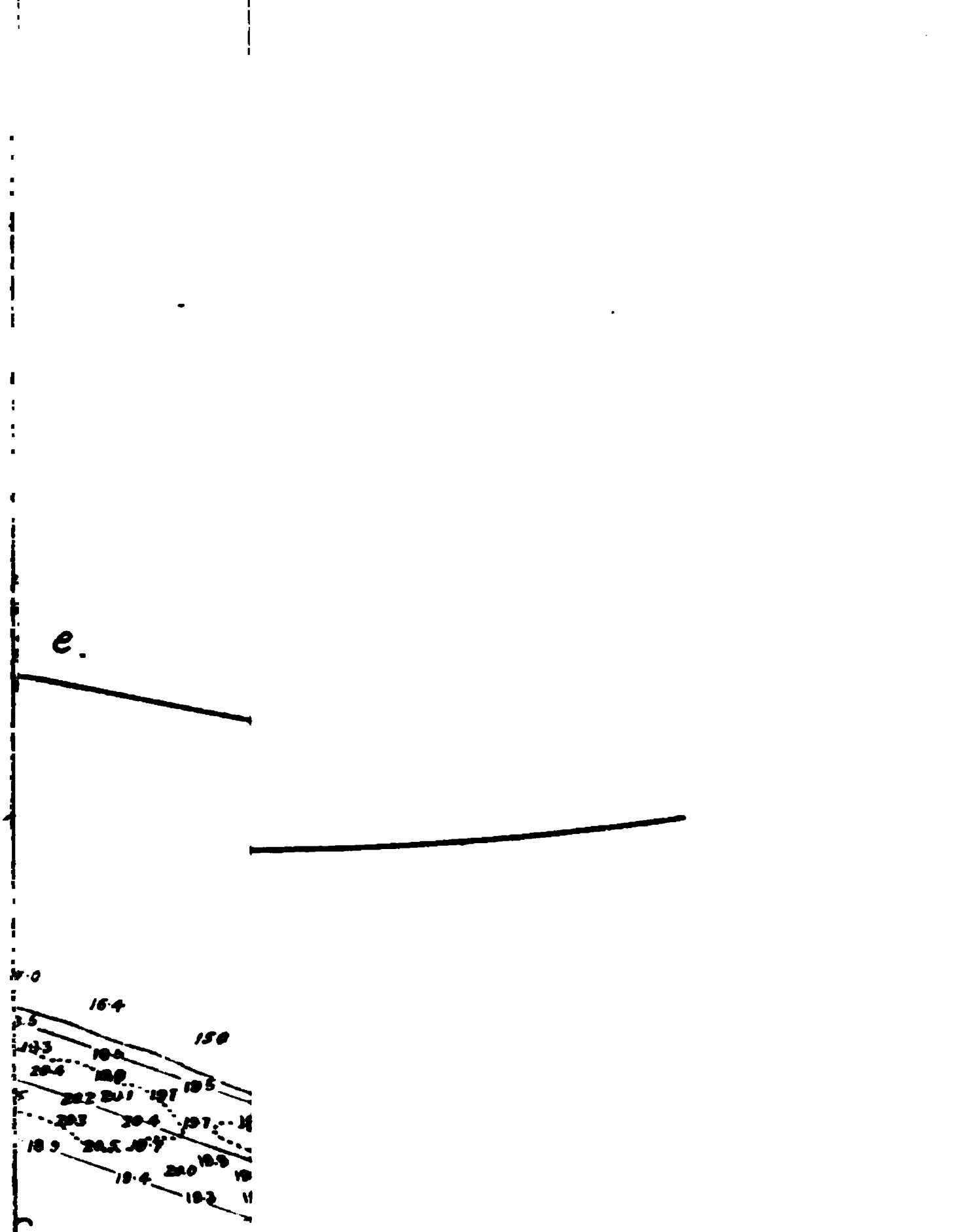

mpany annual report June 30, 1897.

W. E. Craighill
Captain Corps of Engineers U.S.A.

Drawn by R.C. Merritt.

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In making up the cost of work the expenditures of your office are not included.

Present condition of work.—The operations of the dredge *Cape Fear* on the ocean bar have resulted in obtaining a straight, 20-foot mean low-water channel, from deep water inside to deep water outside, with a least width of 150 feet.

At Snows Marsh Channel the work of the dredge *Cape Fear*, together with the scour caused by the dike, have resulted in obtaining a channel 18 feet deep at mean low water, with a least width of 110 feet.

Reaves Point Shoal to May 19, 1897, had shoaled for a length of 1,100 feet to less than 18 feet, the least mid-channel depth on the center line being 16.6 feet. Since that date the work of the *Cape Fear* has increased the least mid-channel depth to 18.4 feet.

At Lilliput Shoal a channel 20 feet deep at mean low water has been dug through the lower reach, the upper 6,000 feet of which is 74 feet wide and the 1,000 feet is 37 feet wide.

Other dredged channels in the river are in about the same condition as at the beginning of the year. The shore lines of Federal Point, Zekes Island, the long line of beaches extending from Zekes Island to Baldhead, or Smiths Island, Baldhead Point, and Oak Island remain in about the same condition as at the report of last year. The inlet cut through the beach from the ocean to New Inlet Basin in October, 1893, has moved about 1,500 feet southward, but retains about the same width and depth. New Inlet and Swash Defense dams are in good and substantial condition.

Tracings showing the condition of the Bar and Snows Marsh channels, and a comparative map of the shore lines in the vicinity of the inlet above referred to, are herewith submitted.

Very respectfully, your obedient servant,

CHAS. HUMPHREYS,
Assistant Engineer.

Capt. W. E. CRAIGHILL,
Corps of Engineers, U. S. A.

L 15.

IMPROVEMENT OF LOCKWOODS FOLLY RIVER, NORTH CAROLINA.

There has been no work during the year.

Prior to June 30, 1897, a total of 81,297 cubic yards of material had been removed, securing a channel of 40 feet least width and 5 feet deep at mean low water from the inlet to Lockwoods Folly Bridge, excepting through two short shoals, the first, one-half mile above the inlet, on which the low-water depth is 3.6 feet, the second, 1½ miles above the inlet, on which the low-water depth is 4.5 feet.

The Chief of Engineers, in a letter dated May 5, 1897 (7589–7), directed that this improvement be dropped from the list of duties pertaining to this district.

This river is in the collection district of Wilmington, N. C.

For description of this river and previous operations, see Annual Reports, 1892, pages 1177–1181; 1893, pages 1432–1434, and 1896, pages 1140–1143.

Money statement.

July 1, 1896, balance unexpended	$181.49
July 1, 1897, balance unexpended	181.49

Appropriated.

Date.	Amount.	Aggregate.
September 19, 1890	$5,000	$5,000
July 10, 1892	3,000	8,000
August 17, 1894	10,000	18,000

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	5	Turpentine, spirits	55
Grains	50	Turpentine, crude	5
Vegetables	72	Lumber and its products	80
Poultry	6	Wood	1,000
Fish and shellfish	217	General merchandise	450
Tar	150		
Rosin	320	Total	2,410

Increase since last year, 247 tons.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1890	7,000	1893	5,000
1891	2,833	1884	2,137
1892	2,361½	1895	2,163

Name and tonnage of vessels plying on Lockwoods Folly River, North Carolina, during the year ending December 31, 1896.

Name of vessel.	Draft loaded.	Net tonnage.	Name of vessel.	Draft loaded.	Net tonnage.
	Feet.			*Feet.*	
Schooner Samuel	4.0	17.50	Sharpie Mabel	4.0	18.39
Sharpie R. E. Lee	3.0	7.81	Sharpie Ruth Darling	3.5	13.56
Sharpie Harvest	4.5	24.69	Sharpie Col. Bogus	2.5	4.00
Sharpie Nancy Anne	4.0	14.39	Sloop Pearl	6.0	4.00

No transportation lines established during the year.

L 16.

PRELIMINARY EXAMINATION AND SURVEY FOR A JETTY NEAR BOGUE INLET, NORTH CAROLINA, IN ORDER TO REMOVE SAND BARS.

[Printed in House Doc. No. 316, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 24, 1897.

SIR: Section 8 of the river and harbor act of June 3, 1896, directs the Secretary of War to cause a preliminary examination to be made for a jetty near Bogue Inlet, North Carolina, in order to remove sand bars, and section 9 of said act directs the Secretary of War, at his discretion, to cause a survey to be made at the same locality and the cost of improvement to be estimated for construction of a jetty to remove sand bar there. The duty of making the examination and the survey thus provided for was assigned to the charge of Lieut. Col. D. P. Heap, Corps of Engineers, and I now have the honor to submit the accompanying copies of his report of August 17, 1896, on the preliminary examination, and of February 19, 1897, on the survey, of said locality. A copy of a map* of the survey is also submitted.

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*Not reprinted. Printed in House Doc. No. 316, Fifty-fourth Congress, second session.

The plan of improvement presented provides for obtaining a mean high-water channel depth of 8 feet from Swansboro to Bogue Inlet by means of jetty construction, supplemented by dredging. The estimated cost is $16,818.75.

It is the opinion of Colonel Heap, which is concurred in by me, that the interests involved do not justify the cost of the improvement proposed.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. A.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. D. P. HEAP, CORPS OF ENGINEERS.

NEW YORK, *August 17, 1896.*

GENERAL: I have the honor to inclose copy of report of Lieut. Edgar Jadwin, Corps of Engineers, who has made a preliminary examination "for a jetty near Bogue Inlet, North Carolina, in order to remove sand bars."

From the facts stated I do not think that the prospective advantage to commerce warrants the expenditure of any considerable sum, and I doubt if any permanent improvement could be obtained without building a costly stone jetty.

The improvement, it appears, would benefit but two parties, lumber companies, and these only for a few years.

The improvement of Bogue Sound (inland waterway between Beaufort Harbor and New River) will suffice for nearly all other commerce.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. EDGAR JADWIN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., August 17, 1896.

COLONEL: I have the honor to submit the following report of an examination, August 5, 1896, "for a jetty near Bogue Inlet, North Carolina, in order to remove sand bars."

Bogue Inlet is the first inlet south of Beaufort Inlet, from which it is 25 miles distant in an air line. It is 15 miles north of New River Inlet. The high-water depth on Beaufort Bar is about 15 feet, and on New River Bar 7 feet; 4.5 feet can be carried from Beaufort Bar through Bogue Sound to Bogue Inlet at high water, and about 1 foot less at low water. Less than 6 inches can be carried through the sounds from Bogue Inlet to New River at low water.

Bogue Bar is reported to have had within recent years a high-water depth varying from 2.5 feet to 16 feet. At date of examination high-water depth was 14 feet on bar. The rise of tide is reported as 3.8 feet on bar and 1.3 feet at Swansboro. Bogue Inlet is nearly opposite the mouth of White Oak River. This river was reported in 1882 (Report Chief of Engineers, 1882, vol. 2, p. 1113) and in 1883 (Report Chief of Engineers, 1884, vol. 2, p. 1055) as not worthy of improvement. It was examined again in 1889 and reported (Report Chief of Engineers, 1889, Vol. II, p. 1127) as worthy of improvement for steamboats from the ocean upward about 29 miles, to near Sabis-

tons Bridge, and thence for flats about 21 miles farther to Collins Ford, at a total expense of about $45,000. The upper 25 miles were again reported (Report Chief of Engineers, 1891, Vol. II, p. 1435) as worthy of improvement. No appropriations have been made for improvement of the river. Since the last examination the Wilmington, Newbern and Norfolk Railway has been built.

Its nearest point to Bogue Inlet is about 15 miles distant by air line. It crosses the White Oak River about 22 miles by air-line distance from the inlet.

Swansboro is a town situated on the right bank of the river about 3 miles in an air line from the inlet. Its population is between 200 and 300. The number of people in the surrounding country who receive and ship some of their supplies over parts of White Oak River is estimated at 1,200. The Swansboro Lumber Company, at Swansboro, is directly interested in the desired improvement. The mill has a daily capacity of 25,000 feet B. M. rough pine. It actually cuts about 3,000,000 feet a year. Sailing vessels drawing about 8 feet cross the inlet bar and come up to the throat of the inlet, where they lie while lumber is transferred to them from lighters. This lightering costs about 20 cents per 1,000 feet. The rate for carrying lumber from Bogue Inlet is said to be about $1 per 1,000 higher than from Beaufort. A steamboat to draw 8 feet is being built at the Swansboro Lumber Company's mill for carrying the product of the mill to Northern markets. There are two routes from Swansboro to the inlet. One, the western or old ship channel, has now 5 feet at high water and is not much used at present. It is claimed that over twenty years ago vessels drawing 10 and 12 feet used it freely. The other, the eastern channel, carries 5.8 feet at high water and is used by the lighters generally and by the steamboats and sharpies going up Bogue Sound.

The cause of the deterioration of the western channel is a shoal which has made out from the southwest point of Dudleys Island marsh and now extends across the channel. The depth of water in sloughs over it varies from 2 feet at times to 7 feet. There was 5 feet at time of examination.

The object of the Swansboro Lumber Company in applying for an examination was the removal of this shoal, which at time of application was thought to be the only one having less than 8 feet at high water from the ocean to Swansboro. In going over the channels I was accompanied by the president of the company and by a man whom they selected as being thoroughly familiar with the channels. About 1,000 soundings were made at approximately equal intervals. The shoal in question was estimated to be about 300 feet across. Besides this shoal two short shoals having about 7 feet on were found between Swansboro and the large shoal. The shoals are claimed to be of very recent formation. A shoal was also found in the throat of the inlet which did not exist at time of application for examination.

The people interested feel quite certain that this one will cut out in the next storm. It is estimated that a survey from which to determine the location of a jetty to produce an 8-foot high-water channel through the large sand bar can be made for $200; and that it can be made to include the other two shoals found at time of examination for $100 additional. The parties interested do not expect to have a stone dike constructed, but desire a cheaper dike, as a pile, pile and brush, or pile and shell. In this connection it should be borne in mind that the teredo is very active in these waters.

The exports from Swansboro and vicinity consist of cotton, clams, fish, watermelons, etc., and are estimated at 1,200 tons annually. The imports consist principally of general merchandise and fertilizer. They are estimated at 600 tons. Practically all of these articles pass through Bogue Sound, but not through Bogue Inlet. In the event of the improvement in question being made, part of the imports would probably come through the inlet.

Swansboro was formerly a prominent naval-stores center. The output of the vicinity is now about 150 barrels of resin and 30 barrels of spirits of turpentine a week. These are included in above exports. It is not claimed that this industry or any other, except lumber, would be greatly affected by improvement. There is thought to be room for development of trucking in the vicinity, but the produce will practically all have to be shipped by inside route. It is claimed that any money saved on transportation of lumber can be used in securing lumber from territory within a greater radius. The Swansboro company has at present in sight about timber enough to run its mill three years. The White Oak corporation has a sawmill at Stella, 8 miles above Swansboro, on the White Oak River. Their output is about 4,500,000 feet B. M., annually, of rough lumber. They run a steamboat and barges regularly down White Oak River and up Bogue Sound to Carolina City, where there is a planing mill in which the management of the Stella mill is interested. Practically all of their lumber now goes through Bogue Sound. Were 8 feet assured through Bogue Inlet to Swansboro, it is possible that one-half their output might be diverted to this route. Lighterage to Carolina City is estimated at 70 cents.

It would seem, then, that the possible annual benefit to the country back of Bogue

Inlet, through the two sawmills, would be a saving of 20 cents per 1,000 on 3,000,000 feet, and of 70 cents per 1,000 on 2,250,000 feet, i. e., $2,175. This can be increased to $3,000 to include occasional damage to lighter's cargo as result of being caught in storm, saving on freights on imports, etc. It does not appear that there would be any increase of total tonnage from the vicinity for several years. When the time comes that all timber within paying reach has been used up, the existence of the deeper water would permit the lumber companies to reach out a little farther for supply of lumber.

Very respectfully,

EDGAR JADWIN,
First Lieut., Corps of Engineers.

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.

SURVEY FOR A JETTY NEAR BOGUE INLET, NORTH CAROLINA, TO REMOVE SAND BAR.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 19, 1897.

GENERAL: I have the honor to transmit herewith:

* * * * * * *

3. Report of Assistant Engineer W. H. Chadbourn, jr., submitting map of survey of Bogue Inlet, North Carolina.

4. Supplemental report of Assistant Engineer W. H. Chadbourn, jr., on Bogue Inlet jetty.

5. Tracing of survey of Bogue Inlet, North Carolina.

The act of June 3, 1896, directs that a survey be made "for a jetty near Bogue Inlet to remove sand bar."

A jetty 1,300 feet long, as shown by the curved line A–B on tracing, and built in the manner described by Mr. Chadbourn, would probably accomplish the object if supplemented by dredging a channel 150 feet wide and 6 feet deep to connect the deep water between C and D.

The estimated cost would be:

1,000 piles, at $2.50 each, in place	$2,500.00
4,500 cubic yards shells, in place, at 75 cents per yard	3,375.00
25,000 cubic yards dredging, at 35 cents	8,750.00
Add 15 per cent for superintendence and contingencies	2,193.75
Total	16,818.75

The intention of the above improvement would be to give a mean high-water depth of 8 feet from Swansboro to Bogue Inlet.

At present there is a mean high-water depth at Bogue Bar of 14 feet. This is reported to have varied within recent years from 2.5 to 16 feet, so if the improvement were made and the project depth obtained there might be times when it could not be used.

Lieutenant Jadwin places the money value of this improvement at $3,000 per annum; that the parties mainly benefited would be two lumber companies, and that the lumber in sight will be exhausted in about three years.

On this basis a fair estimate of the money value of the improvement to commerce would be from $9,000 to $12,000.

It appears from inclosure 3* that the steamboat mentioned in Lieutenant Jadwin's report is not to be used in the connection stated, and that it is unfinished and that work on it has been stopped.

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* Mr. Chadbourn's report of February 9, 1897.

In my opinion, the value of the improvement is not commensurate with its cost.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORTS OF MR. WILLIAM H. CHADBOURN, JR., ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., February 4, 1897.

COLONEL: I have the honor to submit herewith map of a recent survey of Bogue Inlet, North Carolina, and vicinity. The shoal which it was desired to have removed is near the southwest extremity of Dudleys Island.

By comparison with map of April, 1891, of same locality, it will be seen that the best route at that date around the shoal has shoaled very materially.

The steamer mentioned in Lieutenant Jadwin's report of August 17, 1896, is unfinished, work on it has stopped, and all idea of using it in the connection stated has been abandoned, regardless of the removal of the shoal.

The large area covered by sand bars in the vicinity will be noticed. In all probability if the shoal in question was removed others would appear at other points.

I can add nothing further to Lieutenant Jadwin's report.

Very respectfully, your obedient servant,

WM. H. CHADBOURN, JR.,
Assistant Engineer.

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., February 9, 1897.

COLONEL: I have the honor to make the following supplemental report on survey at Bogue Inlet, North Carolina:

I have indicated on the map in pencil a jetty or training dike, which, in my opinion, will create a channel across the obstructing shoal.

The extreme length of the jetty is 2,500 feet, for which I have estimated. But it may be if only carried to point *x* (1,450 feet from root) the purpose will be accomplished.

Jetty to be of round pine or cypress piling, closely driven, reenforced by a shell dike carried to plus 1 foot above high water, 10 feet in width on top, with side slopes of 1½ to 1.

Estimate of cost.

1,872 piles, at $2.50 each, in place	$4,680.00
8,360 cubic yards shells, at 75 cents per yard	6,270.00
	10,950.00
Add 15 per cent for superintendence and contingencies	1,642.50
Total	12,592.50

Such a jetty would be permanent. The piling would last, and form a backbone for the jetty until the shells become thoroughly bedded, partially sanded, and cemented together by a new growth of oysters.

I did not have opportunity to make any current observations, on account of near exhaustion of funds allotted for the survey.

I should estimate the average velocity at half tide in the main channel, near inlet, at 3½ feet per second, this velocity not being much reduced in the channel along southerly edge of Dudleys Island until the shoal is reached, when the velocity is largely reduced, and is not over 2 feet per second above said shoal.

With this improvement made, vessels drawing 7 feet could go to Swansboro and load, the lightering charge of 20 cents per 1,000 feet of lumber being saved. A charge

for towing would probably occur, however, for vessels could hardly sail in such a narrow and tortuous channel.

No reduction in the freight rates could be looked for, since it is the narrow and shallow inlet, with no chance for a vessel to go elsewhere should it arrive there at an unfavorable time to enter with onshore winds, which makes the freight rate so much higher than at Beanfort.

Very respectfully, your obedient servant,

W. H. CHADBOURN, Jr.,
Assistant Engineer.

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.

L 17.

SURVEY OF OCRACOKE INLET, NORTH CAROLINA, TO OBTAIN A CHANNEL 14 FEET IN DEPTH.

[Printed in House Doc. No. 7, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., March 12, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated March 8, 1897, with map,* by Lieut. Col. D. P. Heap, Corps of Engineers, giving the results of a survey of Ocracoke Inlet, North Carolina, to obtain a channel 14 feet in depth, made to comply with the provisions of the river and harbor act of June 3, 1896.

Colonel Heap states that the channel depth at the inlet now exceeds 14 feet at high water, and the plan of improvement presented therefore provides for securing at this locality a channel 14 feet deep at mean low water and 500 feet wide along the line where the least amount of dredging would be required. It is estimated that the work required to secure such a channel will cost $17,250. As the channel through the inlet changes continually, frequent redredging would be required to maintain a 14-foot depth.

The local officer remarks that no special benefit to commerce would accrue from the proposed increased depth until the cuts through Royal Shoal and Beacon Island Slough, which now have a depth of 9 feet at mean low tide, are deepened to 14 feet, and that it would be wiser to deepen these two cuts before undertaking any work of improvement at the inlet. In conclusion, he does not recommend an appropriation toward obtaining a channel 14 feet in depth at mean low water at Ocracoke Inlet.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

REPORT OF LIEUT. COL. D. P. HEAP, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., March 8, 1897.

GENERAL: I have the honor to transmit herewith tracing of survey of Ocracoke Inlet, North Carolina.

The act of June 3, 1896, directs that a survey be made at Ocracoke Inlet to obtain a channel of 14 feet in depth.

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*Not reprinted. Printed in House Doc. No. 7, Fifty-fifth Congress, first session.

As the channel at the inlet is now over 14 feet deep at high water, I assume that the depth refers to mean low water.

I have indicated on the tracing the location of such a channel, 500 feet wide, where the amount of dredging would be the least.

My estimate of the cost is, in round numbers—

30,000 cubic yards dredging, at 50 cents	$15,000
Add 15 per cent for contingencies, superintendence, etc	2,250
Total	17,250

The cost of dredging by contract would be high, as this place is exposed and would require a suction dredge. An ordinary dredge would be too much delayed by bad weather, and would run some risk of being wrecked.

The channel through the inlet is continually changing. Frequent redredging would be needed to maintain a 14-foot depth.

No special benefit to commerce would accrue from this increased depth until the cuts through Royal Shoal and Beacon Island Slough are deepened to 14 feet. They are now 9 feet deep at mean low tide.

It would, in my opinion, be wiser to deepen them before any work is done on the inlet.

I do not recommend an appropriation to obtain a channel 14 feet in depth at mean low water at Ocracoke Inlet.

I inclose copy of letter from Mr. S. F. Burbank, assistant engineer.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. S. F. BURBANK, ASSISTANT ENGINEER.

WILMINGTON, N. C., *March 6, 1897.*

COLONEL: I have the honor to submit herewith tracing showing location of cut for deepening Ocracoke Bar, North Carolina, to 14 feet at mean low water, and the following estimate of the cost thereof:

Amount of material to be excavated, allowing 1 foot for excess below 14 feet:	Cubic yards.
40,000 square feet area, average depth of cutting, 1.59 feet	2,355.56
15,000 square feet area, average depth of cutting, 2.55 feet	1,416.67
300,000 square feet area, average depth of cutting, 2.02 feet	22,444.44
Side slope for south side of cut for 850 feet where the average depth of cutting is 1.5 feet, slope 1 on 2	70.83
Side slope for north side of cut for 750 feet where the average depth of cutting is 1.6 feet, slope 1 on 2	71.11
Total in situ	26,358.61
Increased by 25 per cent for scow measure	6,589.65
Total in scows	32,948.26
At 70 cents per yard	.70
	$23,063.782
Add 15 per cent for superintendence and contingencies	3,459.567
Total	26,523.35

The above estimate is for a cut 500 feet wide on bottom.

Very respectfully, your obedient servant,

S. F. BURBANK, *Assistant Engineer.*

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.

L 18.

SURVEY OF PAMLICO RIVER, NORTH CAROLINA, TO OBTAIN A DEPTH OF TEN FEET UP TO WASHINGTON, AND TO MAKE NECESSARY IMPROVEMENTS OF THE HARBOR AT WASHINGTON.

[Printed in House Doc. No. 5, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., March 13, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated March 9, 1897, by Lieut. Col. D. P. Heap, Corps of Engineers, of the results of a survey of Pamlico River, North Carolina, to obtain a depth of 10 feet up to Washington, and to make necessary improvements of the harbor at Washington, made to comply with the provisions of the river and harbor act of June 3, 1896.

This river has been under improvement by the United States since 1877, the approved project providing for dredging, etc., so as to afford a depth of 9 feet at low water up to Washington. Previous reports have recommended a channel 200 feet wide.

It is estimated that to secure a channel in the river having a depth of 10 feet and width of 200 feet at mean low water up to Washington would cost $156,040.28; but it is the opinion of Colonel Heap, for reasons stated, that a channel depth of 9 feet and width of 100 feet at mean low water are sufficient at the present time for the requirements of navigation on the Pamlico River. A channel of these latter dimensions extending up to Washington could be obtained at an estimated cost of $39,202, and Colonel Heap recommends improvement to this extent as worthy of being undertaken by the General Government. He does not consider that the harbor of Washington "needs further improvement at present."

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

REPORT OF LIEUT. COL. D. P. HEAP, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., March 9, 1897.

GENERAL: I have the honor to inclose herewith tracing* of survey of Pamlico River, North Carolina, and copy of letter from Mr. S. F. Burbank, assistant engineer.

The act of Congress of June 3, 1896, directs that a survey be made of Pamlico River to obtain a depth of 10 feet up to Washington, and to make necessary improvements of the harbor at Washington, N. C.

In the absence of information to the contrary, I assume that this depth refers to mean low water.

Previous reports have recommended a channel 200 wide.

The estimated cost for such a channel 10 feet deep is as follows:

Dredging 709,274 cubic yards material, at 20 cents per cubic yard.....	$141,854.80
Ten per cent for contingencies and superintendence.....	14,185.48
Total.....	156,040.28

*Not printed.

About 80 per cent of the commerce of this river comes through the Albemarle and Chesapeake Canal, which limits the draft of vessels to 7 feet; the present depth of the channel is now sufficient for this.

The cuts through Royal Shoal and Beacon Island Slough having recently been completed to a depth of 9 feet, vessels can now come to Washington, N. C., via Ocracoke Inlet; consequently 9 feet is the greatest depth at present needed in the Pamlico River.

In my opinion a width of 100 feet is sufficient, as it is a rare occurrence for a vessel exceeding 30 feet beam to use the channel.

I would therefore recommend that the project be modified to obtain a channel 100 feet wide and 9 feet deep at mean low water.

This channel is shown by shaded lines on the tracing.

The estimated cost is as follows:

178,189 cubic yards dredging, at 20 cents	$35,638
Ten per cent for superintendence and contingencies	3,564
Total	39,202

This improvement I consider worthy, and I recommend an appropriation of the amount named.

I do not find that the harbor of Washington, N. C., needs further improvement at present.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. S. F. BURBANK, ASSISTANT ENGINEER.

WILMINGTON, N. C., *March 8, 1897.*

COLONEL: I have the honor to submit herewith map and tracing of Pamlico River, North Carolina, at and below Washington, compiled from recent survey made under your direction, with the following report and estimates:

The survey was begun January 12 and completed on February 18, 1897.

* * * * * * *

The estimate for a channel 200 feet wide and 10 feet deep at mean low water, with an allowance of 1 foot for excess below 10 feet, is—

Length of cutting, 27,680 feet; average depth, 1.7674, plus 1 foot for excess:

$\frac{27,680 \times 200 \times 2.7674}{27}$	=567,419.5	cubic yards in situ.
Add 25 per cent for scow measure	141,854.9	cubic yards in scow.
	709,274.4	
	.20	
At 20 cents per yard	$141,854.88	
Superintendence and contingencies	14,185.488	
Total	156,040.368	

In the above estimate no allowance is made for any stumps which may be encountered, the principal area in which stumps were likely to exist having been worked by the United States plant and the stumps removed, and it is not probable that there are any obstructions otherwise that would interfere with the work.

The material is principally soft mud, except in a few localities where sand will be encountered for short distances, and it is thought probable that in the instances the sand is underlaid with mud.

The commerce of the river is of sufficient importance to warrant the expenditure

of a reasonable amount of money for its improvement, and navigation is at present much retarded for the want of sufficient depth for such craft as ply the river.

Under existing conditions, with no inlet into either Albemarle or Pamlico Sound with a greater depth of water than 9 feet, the demands of commerce are not such as to warrant the deepening of the channel at and below Washington to 10 feet, and it is suggested that to deepen same to a depth of 9 feet would meet all the requirements of commerce.

The cost of the improvement to the latter depth would be considerably less, as is shown by the following estimate:

The length of cutting is 22,740 feet; average depth, 0.84 feet, plus 1 foot excess; width of cut, 200 feet:

$\frac{22,740 \times 1.84 \times 200}{27}$	=309,937.78	cubic yards in situ.
Add 25 per cent for scow measure	77,484.445	cubic yards in scow.
	387,422.225	
	.20	
At 20 cents per yard	$77,484.445	
Add for contingencies and superintendence, 10 per cent	7,748.4445	
Total	85,232.89	

The commerce of the river is carried on principally by barges towed by steamers through the Albemarle and Chesapeake Canal. A large number of these barges are not registered in the custom-house, and their tonnage could only be given approximately.

Owing to the tardiness with which replies to inquiries relative to commerce have been received from the firms addressed, it is at present impossible to furnish an accurate statement of the commerce for the year ending December 31, 1896.

Very respectfully, your obedient servant,

S. F. BURBANK, *Assistant Engineer.*

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.

L 19.

SURVEY OF NEUSE RIVER, NORTH CAROLINA, AT AND BELOW NEWBERN, FOR AN 8-FOOT DEPTH AT DEAD LOW WATER.

[Printed in House Doc. No. 317, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 23, 1897.

SIR: I have the honor to submit the accompanying copy of a report, dated February 19, 1897, by Lieut. Col. D. P. Heap, Corps of Engineers, of the results of a survey of Neuse River, North Carolina, at and below Newbern, for an 8-foot channel depth at dead low water, made to comply with the provisions of the river and harbor act of June 3, 1896.

The project of improvement proposed by Colonel Heap provides for the excavation of a channel 8 feet deep at dead low water, with widths of 200 feet at Newbern and 300 feet below that point. The cost is estimated at $59,081.25.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. D. P. HEAP, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 19, 1897.

GENERAL: I have the honor to transmit herewith copy of report of Mr. W. H. Chadbourn, jr., assistant engineer, on survey of Neuse River at and below Newbern, and tracing[1] of same. * * *

The act of June 3, 1896, directs that a survey be made of Neuse River at and below Newbern for an 8-foot depth at dead low water.

On May 1, 1896, an automatic tide gauge was placed at Newbern. A mean of the lowest gauge readings is +3.155. This I assume to be mean low water. In heavy westerly winds the water is as low as the zero of the gauge. This I assume to be dead low water.

The soundings on tracing are therefore referred to the zero of the gauge, and are about 3.155 feet lower than the soundings given on the Coast Survey chart.

The project I recommend for improvement is to excavate a channel at and below Newbern, having a width below Newbern of 300 feet and at Newbern of 200 feet, and a depth of 8 feet at dead low water.

The locations of the cuts are shown on the tracing.

If the work be done by contract the cost of dredging will be high on account of the probability of encountering a number of stumps in situ.

The estimated cost is $59,081.25. Details of cost at the different localities are given in Mr. Chadbourn's letter.

I consider the improvement to be worthy and justified by the interests of the commerce involved.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. WILLIAM H. CHADBOURN, JR., ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., February 6, 1897.

COLONEL: I have the honor to return to you herewith the tracing of map[1] of Neuse River at and below Newbern and blue print of same, and to submit the following supplemental report, as directed by your letter of January 23, 1897:

The mean of the lowest gauge readings each day, as determined by the automatic tide gauge, since May 1, 1896, is +3.155, a result only slightly lower than that previously determined by the staff gauge readings. I have seen the water down to zero on the gauge several times during heavy westerly winds.

I have indicated the proposed dredging on the blue print.

The cuts are located in the direct line of navigation, and, in case of the Newbern cut, on site of previous cut dredged.

It is probable that less stumps will be found at these locations, since in the Newbern cut many have been removed by the United States, and at the others they are seldom, if ever, struck by vessels. In excavating some will probably be encountered.

There are three shoals: 2¼ miles below Newbern (one-half of a mile below Fort Point), one-fourth of a mile below Newbern, and at Newbern, respectively.

There is a passage around the first-named shoal, but it would be rather difficult to navigate, especially at night, so I have located a cut across it.

Both of the shoals below Newbern are short and slight, still they are obstructions to vessels which could otherwise come to Newbern.

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[1] Not printed.

The shoal at Newbern is the longest and of the most consequence. Four of the largest milling establishments and the termini of both railroads entering Newbern are on the north side of the city, and vessels must cross this shoal to reach them. This shoal was formerly a total obstruction, vessels using the circuitous route shown on map to get to the railroad depots, etc.

A cut, known as Ransom's cut, was made through it under appropriation for improving Neuse River about 1879. This cut has shoaled and narrowed some, and was only made to the depth of about 5 feet at dead low water.

The material to be removed is probably mostly sand, overlaid with a fine silt, and undoubtedly many large stumps in situ will be encountered.

For this reason I estimate the cost of dredging at 50 cents per cubic yard.

Estimate of cost.

Fort Point cut, 300 feet wide, 8 feet deep, dead low water..cubic yards..	8,750
Junction cut (second), 300 feet wide, 8 feet deep, dead low water, cubic yards.....	19,500
Newbern cut, 200 feet wide, 8 feet deep, dead low water...cubic yards..	74,500
Total.....	102,750
102,750 cubic yards, at 50 cents.....	$51,375.00
Add 15 per cent for superintendence and contingencies.....	7,706.25
Total.....	59,081.25
If Newbern cut is made only 100 feet wide, with side slope of one on one, it will require removal of 37,250 cubic yards, making the total 65,500 cubic yards, at 50 cents.....	32,750.00
Add 15 per cent for superintendence and contingencies.....	4,912.50
Total.....	37,662.50

It is believed this dredging would be tolerably permanent. The currents in the river are dependent principally on the direction and force of wind, and are generally moderate.

Should the river be bridged at any time, either by the railroad or the county, it is most probable that the bridge would be located north of the limits of the map.

COMMERCIAL STATISTICS.

The principal articles of import are general merchandise, fertilizers, hay and grain, coal, and machinery, aggregating about 25,000 tons per year.

The principal exports are lumber, shingles, fish and shellfish, truck (vegetables), and cotton, aggregating about 150,000 tons per year.

Lumber forms about the only export in sailing vessels or barges, and fertilizers, coal, and hay the principal imports in that class of vessels.

The other articles are almost entirely transported by a line of steamers. There is one regular line of steamers running to Newbern from Elizabeth City, N. C., there connecting with the Norfolk and Southern Railroad, forming a part of the "E. C. D. Line" (Eastern Carolina Dispatch Line). The principal steamer of the line is a vessel of 720 gross tons, 487 net tons, with twin triple-expansion engines and first-class passenger accommodations. This steamer is frequently troubled at the shoals it is proposed to improve when it is heavily loaded to 8 feet draft.

The vessels carrying lumber, fertilizers, etc., are now limited to 7½ to 8 feet draft, which means a small vessel, the freights being relatively higher.

Many of the barges and vessels running to Newbern can not load to their full capacity on account of lack of sufficient water; naturally the rate of freight is calculated on the basis of a full load at less rates.

If the river is deepened to 8 feet at dead low water, vessels of 10 feet draft could easily come to Newbern, which it is believed would cheapen freights and cause a considerable increase of business.

This improvement seems to follow as a natural sequence of the improvement at Ocracoke, N. C., to 9 feet at low water; and to be a worthy one in view of the above facts, and since Newbern is the principal port reached through Ocracoke.

Very respectfully, your obedient servant,

WM. H. CHADBOURN, JR.,
Assistant Engineer.

Lieut. Col. D. P. HEAP,
Engineer Corps, U. S. A.

L 20.

SURVEY OF CAPE LOOKOUT HARBOR OF REFUGE, WITH A VIEW TO MAKING IT CAPABLE OF SHELTERING THE LARGEST VESSELS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 6, 1897.

GENERAL: In accordance with instructions of September 5, 1896, I have the honor to submit the following report (with tracing) of the survey of Cape Lookout, North Carolina, required by the river and harbor act of June 3, 1896.

This act provides for a survey of "Cape Lookout harbor of refuge, with a view to making it capable of sheltering the largest vessels."

A preliminary examination of this locality was made by Maj. W. S. Stanton, Corps of Engineers, and report rendered under date of February 12, 1895 (Annual Report of the Chief of Engineers for 1895, p. 1376).

Major Stanton reported as follows:

* * * * * * *

Considering the usefulness of the harbor, although small, from the facts above set forth, in my opinion it is worthy of improvement by the General Government to the extent of taking suitable means by sand-catching and beach-building devices to prevent the movement of sand into it from the adjacent beaches and sand dunes by the wind and sea.

* * * * * * *

As the present survey is with a view to making the harbor of refuge capable of sheltering the largest vessels, it is necessary to provide for a larger area and a greater depth than exists or can be secured in the bight which now affords shelter to a limited number of small vessels of light draft. My estimate therefore provides for a stone breakwater sheltering an area of 540 acres, with 30 feet or more depth of water. Of this area about 300 acres is more than 36 feet deep.

The greatest exposure in this harbor is from the southeast around through south to southwest.

Storms are reported to commence usually with the wind northeast, then veering gradually around to southwest. During such a storm the sea constantly rises and heaves around the cape, making the worst sea in the vicinity of the projected breakwater after the wind passes the east. When the wind reaches southeast to south-southeast, it frequently blows with great force, during the stormy months, and is accompanied with very high seas.

Observations taken during the survey indicate but gentle currents, except those on the surface due to the wind. The breakwater as designed, and shown on the accompanying tracing, has a general northwesterly direction, extending 6,200 feet beyond the shore line. It is composed of a mound, to the level of low water, formed by the deposit of random stone and surmounted by a superstructure having walls of heavy stones with the interior space filled with rubble.

The cross section adopted for the estimate is the same as that proposed for the Delaware Breakwater by the Commission of Engineer Officers in their report dated January 5, 1892.

The shore end of the breakwater is connected with the sand dunes by a structure of mattresses loaded with stone.

The unit prices adopted for the estimate are derived from a consideration of those of contracts for similar work on the coast, and are based upon the assumption that funds will be supplied as fast as they can be economically expended.

ESTIMATE.

Outer tangent (2,000 feet long):		
Substructure, 560,000 tons, at $2	$1,120,000	
Superstructure, 40,000 tons, at $3	120,000	
		$1,240,000
Inner tangent (4,200 feet long):		
Substructure, 900,000 tons, at $2	1,800,000	
Superstructure, 82,000 tons, at $3	246,000	
		2,046,000
Shore connection (3,600 feet long) and sand fences		74,000
Total cost of breakwater		3,360,000
Engineering and contingencies		340,000
Total		3,700,000

The report of Assistant Engineer William H. Chadbourn, jr., who had immediate charge of the survey, is submitted herewith.

Very respectfully, your obedient servant,

W. E. CRAIGHILL,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., July 16, 1897.

Respectfully submitted to the Chief of Engineers, U. S. A.

The estimate of Captain Craighill, I presume, is for a "harbor of refuge for the largest class of vessels," and not alone the largest sailing vessels engaged in the coasting trade.

There is quite a difference in the two. I am of the opinion that the difference in cost, however, in making it available for the "largest vessels" and the "largest sailing vessels engaged in the coasting trade" is so little that it would be better far to make it available for the former, in which case it will be available for both.

From Cape Henry to the Gulf of Mexico there is not a single harbor of refuge for the largest class of vessels. That one would be a boon to commerce must be evident to the most casual observer. That the cost of such a work will be great must be acknowledged, but the interests are correspondingly great. Cape Lookout is distant only about 60 nautical miles from Cape Hatteras, the most dangerous headland on the coast of the United States, and the scene of unnumbered wrecks.

The keeper of the life-saving station at Cape Lookout reports (see report of William H. Chadbourn, jr., assistant engineer) that in the last nine years 19 schooners, 6 steamships, and 1 bark were disabled or ashore around Cape Lookout, that would have been unharmed in all probability if a safe harbor had been near. How many lives were lost in these wrecks is not stated, but besides the loss of property there would naturally be a corresponding loss of life. But the records do not show all. Perhaps double the number of those that were driven ashore foundered at sea in seeking safety off shore, or were lost on other parts of the neighboring coast. Considering only those reported by the keeper of the life-saving station, and estimating them and their cargoes at (say) $100,000 each, there is a direct loss of $2,600,000 in vessels and cargoes in the last nine years on Cape Lookout itself.

It is not possible to estimate in figures the actual value of a harbor

of refuge in this vicinity, but this Government is deeply interested in everything that tends to lessen the dangers of the sea. Whatever lessens those dangers not only reduces the cost of transportation, but also reduces the actual loss of life in a calling that is as hazardous as it is beneficial to mankind.

I would therefore say that a harbor of refuge at Cape Lookout capable of sheltering the largest vessels is demanded by considerations of humanity as well as of commerce, and that under such circumstances, notwithstanding the very large estimated cost, it is a work worthy to be undertaken by the General Government.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

REPORT OF MR. WILLIAM H. CHADBOURN, JR., ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Southport, N. C., June 28, 1897.

CAPTAIN: I have the honor to submit herewith map and tracing of a survey of Cape Lookout, North Carolina, with reference to an estimate for a harbor of refuge for the largest vessels, with the following report:

I was ordered to make the survey by your predecessor, Lt. Col. D. P. Heap, in January last, to commence as soon as my other work would permit.

The survey being made in the latter part of the winter, during the windy and stormy months, was much retarded by bad weather, and the expense thereby increased. When opportunity offered, the party worked faithfully during all the hours of daylight.

The general plan of the survey consisted of a base line 13,907.3 feet long, with substations for occasional use, and several transit lines roughly measured, then corrected by triangulation.

The base line was measured three times with a 100-foot steel tape. The first measurement was made on a very windy day, and being 3 feet in excess of the other two measurements was discarded. The average of the last two measurements was used as true length of base line. Spring balances were not used, but an effort was made to get a moderate and uniform pull on the tape. No corrections were made for temperature.

In the triangulation all the angles of the important triangles were read twice by different transits. In plotting, large protractors, 22.92 inches radius, were used.

The shore lines and various unimportant objects were located by stadia and compass, with frequent checks on accurately located points.

The sounding lines were of braided Italian hemp, laid off with steel tape and checked every morning and adjusted, when necessary. Two lines were in use when sounding, first one being thrown and then the other. As the bottom was quite uniform, any discrepancy of any consequence in reading would have been quickly discovered.

Gauge observations were made for a period of forty days on a gauge located near the head of Lookout Bight. Observations were made every half hour. Mean low water was taken as the average of all low waters for one lunar month. The gauge was secured by three bench marks. Two iron pipes were driven to an elevation 7.625 above mean low water. These pipes are about 5 feet apart and located as shown on map, about 100 feet from life-saving station boathouse. Bench mark on light-house, a cross on north end of step on southwest side; elevation, 8.440 above mean low water.

The current observations were necessarily taken during moderate times. The paths of the floats are shown on separate sheet. They seem to indicate very gentle currents except on the surface. These surface currents were always in the direction of the wind and undoubtedly served to magnify the velocity of the deep floats, if not cause their entire motion, together with the effect of wind on spindle and flag. No effect is noticed by the changing of the tide.

The floats were long poles, weighted at the bottom sufficient to draw the depth of water as stated, surmounted by a spindle about 5 feet long, on which was a small flag about 1 foot square, The 2-foot float was about 8 inches in diameter for the part that was in the water.

During storms, undoubtedly, some current is produced, but I believe it is mainly along the shore in comparatively shallow water. Quite strong currents are produced at the cape proper, over the shoals. At the commencement of a northeast gale a current of from 4 to 6 miles per hour is said to run across the shoals to the southwest. When the wind shifts to the southward the current is reversed with about the same velocity. On acconnt of the conformation of the coast it is believed that these storm currents are slight in the vicinity of the "bight."

Borings were made at locations shown on map. On the beach and in "bight" only sand, with shells occasionally, was found. The sand became finer as we went down to —26 feet. The boring nearest beach down 6 feet below bottom showed sand finer than on beach, with broken shells occasionally, and in last 1 or 2 feet finer sand, with particles of mud. Boring just off shore of above in 36 feet of water showed a fine gray sand, with considerable mud. Just off shore of this, bottom is soft and sticky. Boring north of Wreck Point about one-half mile showed mostly mud for 6 feet, with some sand and broken shells. Bottom quite soft and sticky.

The mean high water as determined by our observations is 3.8 feet above the mean low water. The extreme range during our observations was 6.5 feet (from —1.1 to 5.4). Extreme range, one tide, was 5.8 feet (—0.4 to 5.4). In February, 1897, just before our survey began, high water reached 6.7 feet, which is reported by captain of life-saving station to have been the highest tide in ten years. It will be seen from the map that this tide covered nearly all the "point" and "hook," and left only a very narrow ridge between the "bight" and ocean, over which the sand washed. Every spring tide submerges a large portion of the beach, and if accompanied by any sea, washes over the beach in many places. By this process, aided by the wind, the present limited harbor is becoming gradually filled up.

* * * * * * *

The muddy bottom in the vicinity of the projected breakwater and area behind it would seem to indicate no drifting sand.

The heaviest winds and seas in this locality are from the south to southeast. In a storm in 1879 the observer at the signal station at Cape Lookout reported a wind velocity of 138 miles an hour, when his apparatus was blown away. He reports houses and chimneys blown down and small craft blown through the air. From best information I could get the high water during that storm was 10.7 feet above mean low water and 6.9 feet above mean high water. All the land in the vicinity was submerged except the hills.

The vicinity in which it is proposed to construct a breakwater to form an artificial harbor is protected by nature from winds and seas from the northwest around the north to east. From the southwest the winds are along shore and rarely cause heavy seas for large vessels. From southwest to northwest the harbor becomes more and more under the lee of the mainland. Therefore from east around through the south to southwest is the exposed quarter. From east to south-southeast the harbor appears to be protected, but as the storms usually commence with the wind northeast and veer gradually around to southwest, the sea constantly rises and heaves around the cape, making an ugly sea in the vicinity of the breakwater as soon as the wind passes east.

Usually in this vicinity, when the wind reaches southeast to south-southeast, it is at its height, frequently blowing with hurricane force during the stormy months and accompanied with a mountainous sea. With winds from south to southeast the projected harbor has an anchorage area of about 313 acres over 26 feet deep and about 540 acres over 30 feet deep.

* * * * * * *

From the captain of the life-saving station at Cape Lookout I ascertain that since 1888 19 schooners, 6 steamships, and 1 bark were disabled or ashore around Cape Lookout, that would have been unharmed, in all probability, if a safe harbor had been near. Two of these steamships and many of the schooners proved total losses. Unknown wrecks are occasionally discovered on or in vicinity of the shoals. Nine large vessels have been anchored south of the beach at one time during northeasters. When the wind shifted, they had to go to sea. Twenty-two schooners have been seen at one time laying to under the lee of Lookout Shoals during northeast gale, and 57 vessels have been sighted passing by in one day. The locality is being frequented more and more as seafaring men learn the advantage of it. The great danger at present is being caught in the great "bight" with a southerly gale.

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Very respectfully, your obedient servant,

WM. H. CHADBOURN, JR.,
Assistant Engineer.

Capt. W. E. CRAIGHILL,
Corps of Engineers.

L 21.

SURVEY OF TOWN CREEK, BRUNSWICK COUNTY, NORTH CAROLINA, WITH A VIEW TO STRAIGHTENING THE RIVER IN AT LEAST TWO PLACES, AND TO OBTAIN A DEPTH OF AT LEAST 8 FEET TO "UPPER BRIDGE," AND TO IMPROVE THE RIVER 6 MILES FARTHER TO THE HEAD OF TIDE WATER, TO A PLACE KNOWN AS THE "ROCKS," BY REMOVING OBSTRUCTIONS, ETC.

[Printed in House Doc. No. 214, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 22, 1897.

SIR: I have the honor to submit the accompanying copy of report of January 16, 1897, by Lieut. Col. D. P. Heap, Corps of Engineers, of the results of a survey made in compliance with requirements of the river and harbor act of June 3, 1896, as follows:

Town Creek, Brunswick County, North Carolina, with a view to straightening the river in at least two places, and to obtain a depth of at least eight feet to "Upper Bridge," and to improve the river six miles farther to the head of tide water, to a place known as the "Rocks," by removing obstructions, and so forth.

Assuming that "a depth of at least eight feet" refers to mean low water, Colonel Heap estimates that the improvement desired will cost $36,288, but he states that such an outlay is not warranted by the commerce of this creek, present or prospective, nor is the 8 feet depth at mean low water required for the one boat navigating the creek.

He states further, however, that to make a channel 40 feet wide at bottom and 5 feet deep at mean low water from the mouth to Upper Bridge and to snag and remove obstructions from the creek from the mouth to the Rocks, provided that no work be done until Upper Bridge is provided with a proper draw, will satisfy the needs of commerce, and estimates the cost of this work at $8,500. It is his opinion that the commerce of the creek warrants this improvement.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. D. P. HEAP, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., January 16, 1897.

GENERAL: I have the honor to transmit herewith copy of report of Mr. Charles Humphreys, assistant engineer, on survey of Town Creek, North Carolina, and tracing * of same in separate package.

The act of June 3, 1896, directs that a survey of this creek be made—

with a view to straightening the river in at least two places, and to obtain a depth of at least 8 feet to "Upper Bridge," and to improve the river 6 miles farther to head of tide water, to a place known as the "Rocks," by removing obstructions, etc.

The estimate to carry out all these improvements, assuming "a depth of at least 8 feet" refers to mean low water, amounts to $36,288.

In my opinion the commerce of this creek, present or prospective, does

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* Not printed.

not warrant such an outlay, nor is the 8 feet depth at mean low water required for the one boat navigating the creek.

If the project be amended as below, it will satisfy the needs of commerce:

To make a channel 40 feet wide at bottom and 5 feet deep at mean low water from the mouth to "Upper Bridge," and to snag and remove obstructions from the creek from the mouth to the "Rocks:" *Provided,* That no work be done until Upper Bridge is provided with a proper draw.

Estimated cost, $8,500.

In my opinion the commerce of the creek warrants this improvement, and I recommend an appropriation of the amount named, viz, $8,500.

Very respectfully, your obedient servant,

D. P. HEAP,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF MR. CHARLES HUMPHREYS, ASSISTANT ENGINEER.

WILMINGTON, N. C., *January 1, 1897.*

COLONEL: I have the honor to submit the following report on the survey and examination of Town Creek, North Carolina, made in accordance with your instructions in letter dated October 26, 1896:

Town Creek empties in the Cape Fear River at the head of Big Island, about 7½ miles below Wilmington, N. C. From its mouth it takes a westerly course through Brunswick County. It is a tide-water stream, there being a rise and fall of about 0.3 foot during low-water season at Rocks Landing, 23⅞ miles above its mouth.

The survey was made with a view to estimating the cost of—

"straightening the creek in at least two places, and to obtain a depth of at least eight feet to Upper Bridge, and to improve the creek six miles farther to the head of tide water, to a place known as the 'Rocks,' by removing obstructions, etc."

The width of the creek between Cape Fear River and the mouth of Indigo Creek, 18½ miles above the mouth, varies from about 80 feet to about 350 feet, and the obstruction to 8-foot navigation by shoals are as follows: First, at the mouth, where the low-water depth does not exceed 3 feet; second, at three points in a loop in the creek, known as the "Four Mile Turn," 11 miles above the mouth (these shoals vary in length from 200 to 400 feet and in depth from 7.4 to 7.8 feet, and will be avoided by a proposed cut-off); third, two short shoals, one at and the other 1,000 feet above Bark Landing, 12½ miles above the mouth (their lengths are 150 and 300 feet, respectively, and their depths 6.5 and 7.7 feet; fourth, just above the mouth of Mill Creek, 17½ miles above the mouth, opposite a sunken flat, where there is barely 8 feet, and very narrow, and will require dredging for a length of about 100 feet. Other obstructions between the mouth of the creek and the mouth of Indigo Creek are sunken logs, snags, and overhanging trees.

From the mouth of Indigo Creek to the upper county bridge, 19¼ miles above the mouth, the width varies from 38 to 100 feet, and will require dredging for about three-fourths of the entire distance. From this bridge to a place known as "Three Creeks," 20½ miles above the mouth, the width varies from 19 to 100 feet and the depth from 3 to 20 feet. At "Three Creeks," and at other points above, the creek forks, making several shallow streams through the swamps, which are from 1 to 2½ feet above the level of the low-water surface. Between "Three Creeks" and Rocks Landing, 23⅜ miles above the mouth, the width varies from 14 to 50 feet and the depth from 0.9 to 10.6 feet. Between the upper county bridge and Rocks Landing the creek is badly obstructed by shoals, sunken timber and other logs, snags, overhanging trees, and short bends.

Steamboat navigation above "Three Creeks" is impracticable, but by clearing of snags, overhanging trees, sunken logs, etc., it may be made navigable for small flatboats, 12 by 25 feet and 1½ to 2 feet draft, for eight or ten months of the year.

The survey and examination were made by Robert C. Merritt. The shore lines of a survey made in 1880 by John P. Darling were used from the mouth of Indigo Creek to Cape Fear River.

Two tracings * are submitted herewith—one of the creek from its mouth to Rocks Landing, on a scale of 500 feet to the inch, and the other from the mouth of Indigo Creek to Rocks Landing, on a scale of 100 feet to the inch.

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* Not printed.

The cost of survey and examination was as follows:

Field work	$188.23
Plotting and tracing maps	50.00
Total	238.23

Estimated cost of obtaining a channel, including straightening the creek in two places, 40 feet wide, bottom width, and 8 feet deep at ordinary low water, to the upper county bridge, and thoroughly snagging the creek from its mouth to Rocks Landing:

Cut at mouth of creek, 5,400 feet long, 32,400 cubic yards, at 25 cents	$8,100.00
Cut-off just below Doyles Creek, 250 feet long, 5,750 cubic yards, at 25 cents	1,437.50
Cut-off just below Doyles Creek, 250 feet long, 80 stumps, at $25	2,000.00
Cut-off just above Doyles Creek, 900 feet long, 21,240 cubic yards, at 25 cents	5,310.00
Cut-off just above Doyles Creek, 900 feet long, 300 stumps, at $25	7,500.00
Cut at Bark Landing, 200 feet long, 1,200 cubic yards, at 25 cents	300.00
Cut 1,000 feet above Bark Landing, 300 feet long, 1,500 cubic yards, at 25 cents	375.00
Cut at sunken flat, 100 feet long, 500 cubic yards, at 25 cents	125.00
Mouth of Indigo Creek to county bridge, 4,130 feet, length of cutting, 30,562 cubic yards, at 25 cents	7,640.50
Snagging below Upper Bridge, 20 miles, at $100	2,000.00
Snagging above Upper Bridge, 3¼ miles, at $400	1,500.00
Total (at present contract prices)	36,288.00

While making the survey the principal shippers along the creek were interviewed, and they said that 5 feet at ordinary low water was sufficient for them at present. The steamer *Daggett*, which carried the principal commerce of the creek, draws only 3½ feet when loaded. Her captain was interviewed, and said that he would be well satisfied with 5 feet at ordinary low water. I have therefore made an estimate for a channel 40 feet wide (bottom width) and 5 feet deep at ordinary low water to the upper county bridge, excluding the two cut-offs, and for thoroughly snagging the creek from the mouth to Rocks Landing, as follows:

Shoal at mouth of creek, 1,600 feet long, 8,000 cubic yards, at 25 cents	$2,000
Shoals from Indigo Creek to Upper Bridge, 1,500 feet long, 12,000 cubic yards, at 25 cents	3,000
Snagging from mouth to Upper Bridge, 20 miles, at $100	2,000
Snagging from Upper Bridge to Rocks Landing, 3¼ miles, at $400	1,500
Total	8,500

The commerce is carried on by the steamer *Daggett*, 25.12 tons register; a small sharpie, less than 5 tons register; rafts, and flatboats, and is as follows:

Articles.	Tons.	Value.
OUT FREIGHT.		
1,000 cords of wood	1,000	$2,000
350,000 feet timber	7,000	2,100
50,000 shingles	31	2,015
2,100 barrels rosin	336	2,100
300 barrels spirits turpentine	67	4,200
600 barrels crude turpentine	90	1,080
1,500 barrels tar	225	1,650
100 bales cotton	25	3,500
3,000 bushels peanuts	42	1,800
4,000 bushels potatoes	120	1,400
500 head hogs	13	1,250
4,000 head chickens	6	800
4,000 dozen eggs	2	500
25 barrels apples	2	25
2,500 watermelons	25	150
500 bushels grain	13	250
100 head cattle	25	1,000
Miscellaneous	50	1,250
	9,072	27,070
IN FREIGHT.		
General merchandise	1,000	20,302
Total	10,072	47,372

With the exception of the timber and wood, the greater portion of the freight is received at the upper county bridge. This bridge has no draw, consequently steamboat navigation is stopped at this point; but there is very little or nothing to be gained by going above, as it is impossible to go farther than Three Creeks, which is only three-fourths of a mile above the bridge.

At present the commerce above this bridge consists of about 100,000 feet B. M. of timber logs and about 300 cords of wood. I am informed that about one-fourth of the commerce of the creek, excluding timber and wood, is hauled from points above the bridge, and if the creek was thoroughly snagged to Rocks Landing the greater portion of this would be brought down by the creek.

A proposed railroad, connecting Wilmington and Southport, is to cross the creek about one-half mile above the Upper Bridge. About half of the road has been graded, but work on it is now stopped.

The steamer *Daggett* is scheduled to make one trip per week up this creek, but owing to the uncertainty of navigation and "bad management" she very often fails to make regular trips, consequently the people are compelled to haul a large portion of the lighter products, estimated at 2,000 tons, across the country to Wilmington by wagons, a distance of 10 to 15 miles, and to pay ferriage across Brunswick and Cape Fear rivers at the following rates:

One man to Wilmington and return	$0.20
One man with horse	.40
One man with horse and cart	.64
One man with horse and buggy	.96
One man with two horses and wagon	1.12

This makes his ferriage more than the freight would be by the boat.

If the improvement is made, the commerce will shortly be increased by this 2,000 tons, and in the next five or six years there will probably be a further increase of from 25 to 50 per cent.

I am informed that they intend making two trips per week with the steamer *Daggett* from now on.

The creek is crossed by two county bridges, known as the lower and upper. The Lower Bridge has a draw with a 20-foot span, and the Upper Bridge has no draw.

Very respectfully, your obedient servant,

CHAS. HUMPHREYS,
Assistant Engineer.

Lieut. Col. D. P. HEAP,
Corps of Engineers.

APPENDIX M.

IMPROVEMENT OF WACCAMAW AND LUMBER RIVERS, NORTH CAROLINA AND SOUTH CAROLINA, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH CAROLINA.

REPORT OF CAPT. FREDERIC V. ABBOT, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Waccamaw River, North Carolina and South Carolina.
2. Lumber River, North Carolina and South Carolina.
3. Little Pedee River, South Carolina.
4. Great Pedee River, South Carolina.
5. Mingo Creek, South Carolina.
6. Winyah Bay, South Carolina.
7. Santee River, South Carolina.
8. Wateree River, South Carolina.
9. Congaree River, South Carolina.
10. Harbor at Charleston, South Carolina.
11. Wappoo Cut, South Carolina.
12. Beaufort River, South Carolina.

HARBOR LINES.

13. Ashley and Cooper rivers at Charleston, South Carolina.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., July 13, 1897.

GENERAL: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1897, for the works of improvement of rivers and harbors which have been in my charge.

Very respectfully, your obedient servant,

FREDERIC V. ABBOT,
Captain of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

M 1.

IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 848, Annual Report for 1880; for map of river see Annual Report for 1889, page 1200.

WORK OF PAST YEAR.

A steam snag boat was run over the river at intervals, keeping the improved part of the stream in good condition. A large side-wheel steamer was built at Conway to run on the river, and two new lines of transportation were established. Boats have been run safely by night as well as by day on the improved part of the stream. For details see appended report of my assistant engineer, Mr. Reid Whitford, who has been in local charge.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$6,420.87
June 30, 1897, amount expended during fiscal year	3,556.74
July 1, 1897, balance unexpended	2,864.13
July 1, 1897, outstanding liabilities	231.39
July 1, 1897, balance available	2,632.74
Amount (estimated) required for completion of existing project	38,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	30,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 14, 1880	$15,000	Approved September 19, 1890	$12,500
Approved March 3, 1881	10,000	Approved July 13, 1892	10,000
Passed August 2, 1882	4,400	Of August 17, 1894	6,000
Approved July 5, 1884	6,000	Of June 3, 1896	6,000
Approved August 5, 1886	15,000		
Of August 11, 1888	15,000	Total	99,900

Total expenditures, including June 30, 1897, $97,035.87.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	76,000	13,300	$228,000	78,000	15,600	$156,000
Tar.....do....	557	56	1,114	407	81	814
Spirits of turpentine.....do....	12,000	2,250	240,000	14,000	2,800	220,000
Turpentine, crude.....do....	6,000	840	15,000	4,000	600	8,000
Cotton.....bales..	5,500	1,375	275,000	5,000	1,250	175,000
Timber.....sticks..	9,547	14,326	40,980	10,640	19,152	53,200
Lumber.....feet..	8,800,000	18,333	132,000	9,000,000	15,000	117,000
Shingles.....	9,800,000	4,900	78,400	9,200,000	4,600	73,600
Rough rice.....bushels..	122,000	2,684	152,500	155,100	2,806	178,365
Rice, clean.....barrels..	12,000	1,950	195,000	15,508	2,714	271,390
Miscellaneous articles, tallow, eggs, wax, game, poultry, etc.....	.....	1,231	123,118	.....	1,500	75,000
Total.....	.....	61,245	1,481,112	.....	66,103	1,328,369
INWARD FREIGHTS.						
General merchandise.....	.....	15,000	750,000	.....	17,000	850,000
Grand total.....	.....	76,245	2,231,112	.....	83,103	2,178,369

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	53,167	10,633	$106,334	72,220	14,444	$144,440
Spirits of turpentine.....do....	10,893	2,179	163,395	14,744	2,948	258,020
Crude turpentine.....do....	1,330	266	2,660	4,740	948	9,480
Tar.....do....	1,238	248	2,476	2,388	477	4,776
Cotton.....bales..	17,230	4,307	603,050	5,668	1,417	198,380
Rough rice.....bushels..	195,279	4,491	195,279	93,000	2,139	106,950
Rice, clean.....barrels..	19,945	3,490	299,175	6,600	1,155	115,500
Rice flour.....bushels..	25,000	250	7,500	25,000	250	7,500
Hides.....bales..	3	1	200	6	2	400
Wool.....do....	5	1	400	34	13	5,100
Clams.....barrels..	2,121	424	8,484	3,091	618	12,361
Fish.....do....	363	19	95	430	21	2,150
Lumber.....feet B. M..	6,700,000	11,167	100,500	9,158,007	15,263	137,371
Timber.....pieces..	10,000	20,000	50,000	37,463	37,463	168,583
Shingles.....	7,000,000	3,500	56,000	9,244,291	4,622	73,950
Total.....	.....	60,976	1,595,548	.....	81,780	1,244,964
INWARD FREIGHTS.						
General merchandise.....	.....	10,000	500,000	.....	17,518	875,900
Grand total.....	.....	70,976	2,095,548	.....	99,298	2,120,864

Commercial statistics—Continued.

Articles.	1896.			1896.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	75,000	12,125	$96,750	74,000	14,800	$185,000
Spirits of turpentine.....do....	15,000	2,812	195,000	13,000	3,250	195,000
Crude turpentine.....do....	5,130	718	8,978	3,500	700	8,750
Tar.....do....	1,000	200	2,000	2,500	875	10,000
Cotton.....bales..	9,091	2,273	272,730	8,000	2,000	320,000
Rough rice.....bushels..	131,000	2,382	98,250	147,000	3,234	147,000
Rice, clean.....barrels..	15,060	2,447	165,060	17,400	2,827	278,400
Rice flour.....bushels..	11,255	100	3,000	1,250	13	175
Hides.....bales..	4	1	200	25	6	1,250
Wool.....do....	60	25	10,000	95	43	2,850
Clams.....barrels..	3,091	618	12,364	9,000	1,800	27,000
Fish and caviare.....packages..	4,950	200	115,000	5,000	124	150,000
Lumber.....feet B. M..	9,000,000	15,000	150,000	10,000,000	16,666	150,000
Timber.....pieces..	63,940	69,055	224,430	65,000	130,000	260,000
Cross-ties.....	1,338	10	335	.....	.....	.....
Shingles.....	14,000,000	7,000	112,000	13,000,000	6,500	65,000
Total.....	.....	116,466	1,463,697	.....	182,838	1,800,425
INWARD FREIGHTS.						
General merchandise.....	.....	12,000	600,000	.....	20,550	513,750
Grand total.....	.....	128,466	2,063,697	.....	203,388	2,314,175

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Rosin.....barrels..	75,000	12,500	$175,500
Spirits turpentine.....do....	17,500	4,375	262,500
Crude turpentine.....do....	3,000	600	6,750
Cotton.....bales..	8,000	2,000	240,000
Tar.....barrels..	3,150	1,102	9,450
Rough rice.....bushels..	150,000	3,300	150,000
Rice, clean.....barrels..	15,000	3,000	240,000
Rice flour.....bushels..	1,250	13	100
Hides.....bales..	50	15	2,450
Wool.....do....	120	48	16,800
Fish and vegetables.....cases..	10,500	420	15,750
Clams and oysters.....barrels..	9,000	1,800	27,000
Game, etc.....packages..	5,000	124	100,000
Timber.....pieces..	75,000	150,000	300,000
Lumber.....feet B. M..	10,000,000	25,000	150,000
Shingles.....	15,000,000	7,500	75,000
Wood.....cords..	2,000	2,000	4,000
Cross-ties.....	20,000	1,400	6,000
Total.....	.....	216,300	1,781,300
INWARD FREIGHTS.			
Miscellaneous, fertilizers, etc.....	.....	25,000	625,000
Grand total.....	.....	241,300	2,406,300

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on improving Waccamaw River, North Carolina and South Carolina, for the fiscal year ending June 30, 1897.

The work consisted of removing obstructions from the channel and cutting overhanging trees from the banks at intervals from the mouth of the river to a point 128 miles above. This extended the improvement of the stream 7 miles farther up than any work that had ever been done previously. From the channel there were removed 644 logs, 414 stumps, 457 large snags, and 18 cords of small snags. From the banks 714 trees and 29 cords of brush were cut. Of the total amount expended seven-tenths were used on the channel and three-tenths on the banks. The removal of each obstruction cost approximately 40 cents. The owners and captains of the steamers continue to express themselves as being highly pleased with the improvement of the river,

and are extremely anxious that this work should be carried higher up, so as to permit their steamers to arrive at more convenient landings to the people, to prevent the long hauls of freight overland.

RECOMMENDATIONS.

It is respectfully recommended that the same character of work be done on the river above Conway, as heretofore, as rapidly as possible, with probably some dredging where it may be needed, and that the existing width and depth below Conway be maintained.

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Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 2.

IMPROVEMENT OF LUMBER RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see page 1102, Annual Report for 1887.
For map of river, see page 1198, Annual Report for 1890.

WORK OF PAST YEAR.

No appropriation for this river was made in the last river and harbor act, and the small balance left from the previous appropriation was spent in running over the entire length from the mouth to Lumberton, removing such obstructions as could be most advantageously removed in the short time the expenses of the snag boat could be paid for from this appropriation. The boat was a small steamer 60 feet long, 16 feet feet beam, and drew 3 feet of water. The trip was made at an ordinary stage of the river, and shows that the stream can be navigated without danger by a small steam flat. As the action of Congress at its last session does not indicate the intention of maintaining the improvement already secured on this river, and as no funds are now on hand to its credit, no further reports will be submitted.

The details of work done are given in the appended report of my assistant engineer, Mr. Reid Whitford, who has been in local charge during the year and has done his duty faithfully.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$705.70
June 30, 1897, amount expended during fiscal year	705.70
Amount (estimated) required for completion of existing project	16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	16,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

For this improvement the following appropriations have been made:

By act of Congress—

Of August 11, 1888	$5,000
Approved September 19, 1890	5,000
Approved July 13, 1892	5,000
Of August 17, 1894	4,000
Total	19,000

Total expenditures, including June 30, 1897, $19,000.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
Timber.....sticks..	3,000	4,500	$12,600	5,000	6,000	$18,000
Fertilizers.....	.....	100	2,000	.....	200	4,000
General merchandise.....	.....	500	25,000	.....	600	30,000
Total.....	.....	5,100	39,600	.....	6,800	52,000

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	500	1,250	$17,500	400	100	$14,000
Eggs.....crates..	200	8	400	.....	.....	.....
Fowls.....dozen..	50	1	150	.....	.....	.....
Timber.....logs..	5,500	5,500	16,500	.....	.....	.....
Lumber.....feet B. M..	.....	.....	.....	150,000	250	3,000
Logs.....	.....	.....	.....	9,600	9,600	28,800
Total.....	.....	6,754	34,550	.....	9,950	45,800
INWARD FREIGHTS.						
General merchandise.....	.....	400	20,000	.....	.....	.....
Fertilizers, merchandise, etc.....	.....	.....	.....	.....	600	30,000
Grand total.....	.....	7,154	54,550	.....	10,550	75,800

Articles.	1895.			1896.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	600	150	$18,000	600	150	$24,000
Rosin.....barrels..	3,000	525	3,750	4,000	800	8,000
Spirits of turpentine.....	300	56	3,900	800	200	12,000
Timber.....sticks..	20,000	18,000	58,500	30,000	60,000	120,000
Total.....	.....	18,731	84,150	.....	61,150	164,000
INWARD FREIGHTS.						
General merchandise and fertilizers.....	.....	400	20,000	.....	500	25,000
Grand total.....	.....	19,131	104,150	.....	61,650	189,000

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton.....bales..	500	100	$15,000
Rosin.....barrels..	2,500	500	5,000
Spirits turpentine.....do....	184	46	2,760
Timber.....sticks..	25,000	50,000	100,000
Lumber.....feet B. M..	100,000	50	1,000
Miscellaneous freights.....	.....	50	2,500
Total.....	.....	50,746	126,260
INWARD FREIGHTS.			
Fertilizers.....	.....	1,000	20,000
Merchandise.....	.....	100	5,000
Grand total.....	.....	51,846	151,260

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on Lumber River, North and South Carolina, for the fiscal year ending June 30, 1897.

The Congress of 1896 made no appropriation for this stream, and the small balance left available from the old appropriation was expended in clearing the channel and banks from obstructions as well as possible, from the mouth of the river to Lumberton, 71 miles. From the channel there were removed 290 logs, 115 stumps, 387 large snags, 4 cords of small snags. From the banks 328 trees and 4 cords of brush were cut. Of the total amount spent seven-tenths were used on the channel and three-tenths on the banks. The removal of each obstruction cost approximately 22 cents.

One of the United States self-propelling snag boats, 60 feet long, 16 feet beam, with a draft of about 3 feet, passed entirely over the route from Georgetown via the Great Pedee, Little Pedee, and Lumber rivers to the town of Lumberton, situated at the head of navigation of the Lumber River. This trip was made at an ordinary stage of water, and the hoister experienced no difficulty in reaching its destination, except by such obstructions as were encountered, consisting of fallen timber and leaning trees. A sufficient number of these were removed to permit the passage of the boat, very roughly clearing the way. This is the first steamboat larger than the ordinary small launch that had ever gone to Lumberton, and as might be supposed created considerable excitement and enthusiasm among the people along the way. The inhabitants of the country manifested a great deal of interest in the boat, and were unanimous in the wish that a steamboat transportation line might be established on the river, so as to enable them to move their freights and supplies without the expense of hauling long distances overland to and from shipping points.

There is no reason why a steamboat of suitable size and draft could not be run on Lumber River most of the year, to the very great convenience of the people, if the logs were removed from the channel and the overhanging trees from the banks.

RECOMMENDATIONS.

It is respectfully recommended that your report state strongly the facts of the case, so that Congress may understand more fully the needs of the stream. A further and sufficient appropriation by Congress will put the river in fair condition for navigable purposes, and it will require a yearly appropriation of about $2,000 to maintain it. The commerce which would naturally follow this improvement would be worth such an expenditure.

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Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 3.

IMPROVEMENT OF LITTLE PEDEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see page 1111, Annual Report for 1887.
For map of river, see page 1214, Annual Report for 1890.

WORK OF PAST YEAR.

The snag boat worked on the river for about seven months, and improved the river very much.

A small amount of dredging where this river enters the Great Pedee is needed to carry out the project to the full depth, but the annual appropriations have been insufficient to permit this work in addition to the necessary snagging. Like the other rivers in this district, occasional snagging must be done on the Little Pedee River, even after the original project is completed.

An expenditure of $2,000 per annum will suffice for maintenance. For details of work done, reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has been in local charge during the year.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$3,783.10
June 30, 1897, amount expended during fiscal year	2,297.29
July 1, 1897, balance unexpended	1,485.81
July 1, 1897, outstanding liabilities	57.00
July 1, 1897, balance available	1,428.81
Amount (estimated) required for completion of existing project	28,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—	
Of August 11, 1888	$5,000
Approved September 19, 1890	5,000
Approved July 13, 1892	5,000
Of August 17, 1894	4,000
Of June 3, 1896	3,000
Total	22,000

Total expenditures, including June 30, 1897, $20,514.19.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin ..... barrels	3,920	686	$5,880	5,000	1,000	$10,000
Spirits of turpentine ..... do	408	77	8,160	636	127	9,540
Cotton ..... bales	310	78	15,500	600	150	21,000
Ton timber ..... sticks	2,200	3,300	9,240	4,240	5,088	15,264
Shingles	30,000	15	240	20,000	10	160
Total	.....	4,156	39,020	.....	6,375	55,964
INWARD FREIGHTS.						
General merchandise	.....	458	13,740	.....	740	37,000
Grand total	.....	4,614	52,760	.....	7,115	92,964

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin ..... barrels	4,400	880	$8,800	5,300	900	$10,600
Spirits of turpentine ..... do	750	150	11,250	800	175	14,000
Cotton ..... bales	700	175	24,500	700	150	24,000
Ton timber ..... sticks	.....	.....	.....	6,000	6,000	18,000
Timber ..... do	4,050	4,050	12,150	.....	.....	.....
Shingles	20,000	10	160	.....	.....	.....
Eggs ..... crates	275	4	550	.....	.....	.....
Pease ..... bushels	300	9	375	.....	.....	.....
Cross-ties ..... number	.....	.....	.....	10,000	250	3,000
Total	.....	5,278	57,785	.....	7,475	69,600
INWARD FREIGHTS.						
General merchandise, fertilizers, etc	.....	875	43,750	.....	900	45,000
Grand total	.....	6,153	101,535	.....	8,375	114,600

Articles.	1896.			1896.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	6,000	1,050	$7,500	5,500	1,100	$11,000
Spirits of turpentine.....do....	940	176	12,220	1,200	300	18,000
Cotton.....bales..	1,250	312	37,500	2,000	500	80,000
Timber.....sticks..	10,000	9,000	29,250	16,000	14,400	64,000
Cross-ties.....	20,000	1,400	6,000	.....	.....	.....
Miscellaneous articles, shingles, staves, etc.....	.....	.....	.....	.....	50	1,500
Total.....	.....	11,938	92,470	.....	16,350	174,500
INWARD FREIGHTS.						
General merchandise, fertilizers, etc.....	.....	500	26,000	.....	150	7,500
Fertilizers.....	.....	.....	.....	.....	550	16,500
Grand total.....	.....	12,438	117,470	.....	17,050	198,500

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton.....bales..	10,500	210	$31,500
Rosin.....barrels..	3,200	640	6,400
Spirits turpentine.....do....	550	137	8,250
Railroad cross-ties.....	50,000	3,500	15,000
Timber.....sticks..	4,000	8,000	16,000
Miscellaneous freights, shingles, staves, etc.....	.....	200	10,000
Total.....	.....	12,687	87,150
INWARD FREIGHTS.			
Fertilizers.....	.....	350	7,000
General merchandise.....	.....	125	6,250
Grand total.....	.....	13,162	100,400

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on the Little Pedee River, South Carolina, for fiscal year ending June 30, 1897:

The work consisted in removing obstructions from the channel and banks and was resumed November 21, 1896, and continued to June 4, 1897, when the United States snag boat was withdrawn from this river and put on the Waccamaw, where work was more urgently needed at the time.

Operations were carried on from the mouth 65 miles upward to the head of steamboat navigation. The following obstructions were removed: From the channel, 873 logs, 622 stumps, 1,123 large snags, and 24 cords small snags; from the banks, 1,888 trees and 37 cords brush cut. Of the total amount expended, six-tenths were used on the channel and four-tenths on the banks. The removal of each obstruction cost approximately 21 cents.

Those who have been using the river for navigation purposes during the year report very decided improvement by the recent removal of obstructions by the United States Government, and that the stream is in a better condition generally for the transportation of freights than it has ever been. There is, however, very much left to be done of the same character of work before a thoroughly cleared channel is secured. There are a few places in this river which if dredged will be of incalculable benefit. The appropriations have been too meager up to this time for this to be considered. After the improvement of the above stream has been made it will probably require $2,000 per year to maintain it.

RECOMMENDATIONS.

It is respectfully recommended that the work be continued until a thoroughly cleared channel from its mouth upward to the head of steamboat navigation be provided, by removing all obstructions, including certain sand bars, if appropriations are sufficient to permit the latter.

EMPLOYEES.

The same employees were engaged on this stream as on the Lumber River, one plant working on both streams.

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 4.

IMPROVEMENT OF GREAT PEDEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 753, Annual Report for 1873. For special description, see page 845, Annual Report for 1880, and page 723, Annual Report for 1879. For map of river, see page 1180, Annual Report for 1889.

WORK OF PAST YEAR.

The snag boat was run over the whole length of the river at intervals, and the channel kept clear for schooners as far as Smith Mills, and for the regular river steamers for 50 miles farther. The new light-draft snag boat worked on the river between this point and Cheraw, the head of navigation. This upper 69 miles of the river still requires much snagging and some dredging. The latter, while not specifically mentioned in the project, is necessary to secure the depth of 3½ feet which is defined by the project. The shoals appear to consist of sand which has accumulated at points where the river was much obstructed by fallen trees, and it is believed that if the depth be once secured it will be maintained for a considerable time. For details of work done, reference is made to the report of my assistant engineer, Mr. Reid Whitford.

This river is in the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$12,521.77
June 30, 1897, amount expended during fiscal year	4,526.62
July 1, 1897, balance unexpended	7,995.15
July 1, 1897, outstanding liabilities	377.36
July 1, 1897, balance available	7,617.79
Amount (estimated) required for completion of existing project	9,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	9,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 14, 1880	$7,000	Approved September 19, 1890	$12,500
Approved March 3, 1881	6,000	Approved July 13, 1892	10,000
Passed August 2, 1882	6,000	Of August 17, 1894	6,000
Approved July 5, 1884	8,000	Passed June 3, 1896	12,000
Approved August 5, 1886	20,000		
Of August 11, 1888	20,000	Total	107,500

Total expenditures, including June 30, 1897, $99,504.85.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	5,926	1,483	$296,000	5,780	1,445	$202,304
Clean rice.....barrels..	16,342	2,656	265,558	16,560	2,898	289,750
Rough rice.....bushels..	83,000	1,827	103,750	88,000	1,524	101,200
Rosin.....barrels..	35,800	6,265	50,120	30,000	6,000	60,100
Spirits of turpentine.....do....	4,014	652	80,280	5,436	1,087	81,540
Cypress shingles	6,705,967	3,353	53,640	6,970,000	3,485	55,760
Lumber, cypress .....feet B. M..	3,000,000	6,250	45,000	3,100,000	5,166	46,500
Cypress logs.....do....	22,547	33,821	81,169	.....	.....	.....
Wood .....cords..	225	225	563	2,000	2,000	4,000
Hides, wool, staves, etc.....	.....	250	7,500	.....	352	17,600
Timber .....sticks..	.....	.....	.....	51,640	61,968	216,888
Cross-ties.....	.....	.....	.....	18,000	144	5,400
Total	.....	56,782	983,880	.....	86,069	1,090,992
INWARD FREIGHTS.						
General merchandise	.....	5,562	383,450	.....	6,402	320,100
Grand total.....	.....	62,344	1,367,330	.....	92,471	1,401,092

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	21,845	4,269	$42,690	24,534	4,906	$49,068
Spirits of turpentine.....do....	3,391	678	50,865	7,211	1,442	126,192
Cotton.....bales..	3,610	903	126,350	6,110	1,027	213,850
Crude turpentine.....barrels..	.....	.....	.....	1,340	268	2,680
Ton timber.....sticks..	58,949	58,949	176,847	30,000	60,000	165,000
Shingles	9,163,000	4,581	73,304	6,000,000	3,000	36,000
Eggs and poultry.....crates..	275	4	550	.....	7	1,000
Pease .....bushels..	300	9	375	.....	.....	.....
Rice, rough.....do....	206,343	4,746	206,343	52,309	1,208	60,155
Lumber .....feet B. M..	4,000,000	6,667	60,000	4,000,000	6,667	80,000
Wood .....cords..	2,800	2,800	5,600	2,800	2,800	5,600
Tar.....barrels..	850	170	1,700	1,200	240	2,400
Cross-ties.....	33,000	2,640	9,900	48,750	1,215	14,625
Miscellaneous articles, hides, wool, staves, etc.....	.....	400	20,000	.....	450	22,500
Total	.....	86,816	774,524	.....	83,225	779,070
INWARD FREIGHTS.						
General merchandise	.....	7,845	392,350	.....	7,800	390,000
Grand total.....	.....	94,661	1,166,874	.....	91,025	1,169,070

Articles.	1895.			1896.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Rosin.....barrels..	28,500	4,987	$85,625	20,000	4,000	$40,000
Spirits of turpentine.....do....	6,500	1,219	84,500	7,000	1,750	105,000
Cotton.....bales..	6,000	1,500	180,000	5,000	1,250	200,000
Crude turpentine.....barrels..	1,260	176	2,205	3,100	620	7,750
Timber.....sticks..	86,000	77,000	250,250	90,000	180,000	360,000
Shingles	7,000,000	3,500	56,000	8,000,000	4,000	40,000
Rough rice.....bushels..	85,000	1,870	62,750	99,000	2,178	99,000
Lumber .....feet B. M..	5,000,000	8,283	75,000	7,500,000	12,666	112,500
Wood .....cords..	2,000	3,000	4,500	3,000	3,000	6,000
Cross-ties.....	50,000	3,500	15,000	.....	10,000	40,000
Staves	80,000	80	1,600	.....	.....	.....
Miscellaneous articles	.....	300	90,000	.....	500	15,000
Total	.....	105,415	858,430	.....	219,964	1,025,250
INWARD FREIGHTS.						
General merchandise, fertilizers, etc.....	.....	700	35,000	.....	10,000	300,000
Grand total.....	.....	106,115	893,430	.....	229,964	1,325,250

Commercial statistics—Continued.

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Rosin ..... barrels..	21,425	4,285	$42,850
Spirits turpentine ..... do....	5,670	1,442	86,565
Crude turpentine ..... do....	3,800	760	7,600
Cotton ..... bales..	8,954	1,797	268,620
Tar ..... barrels..	450	90	1,350
Cross-ties	68,365	4,785	20,509
Shingles	10,000,000	5,000	30,000
Lumber, cypress ..... feet B. M..	5,000,000	10,000	90,000
Rough rice ..... bushels..	90,000	1,980	90,000
Timber, cypress ..... sticks..	30,000	60,000	120,000
Wood ..... cords..	550	550	1,100
Timber, ash ..... sticks..	4,000	8,000	12,000
Timber, pine ..... do....	2,000	4,000	4,000
Miscellaneous freights, pease, eggs, etc	.....	167	8,350
Total	.....	102,856	782,944
INWARD FREIGHTS.			
Fertilizers	.....	6,036	120,720
General merchandise	.....	5,285	264,250
Grand total	.....	114,177	1,167,914

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on improving Great Pedee River, South Carolina, for fiscal year ending June 30, 1897:

The work was carried on under the existing project, which consisted in removing obstructions from the channel and clearing the banks of overhanging trees. Operations began July 1, 1896, and continued at intervals throughout the fiscal year, between the mouth of the river and 172 miles above. From the channel the following obstructions were removed: 672 logs, 347 stumps, 919 large snags, and 3 cords of small snags. From the banks 696 trees were cut. Of the total actual expense eight-tenths was used on the channel and two-tenths on the banks. The removal of each obstruction cost, approximately, 55 cents.

While the project provides for a depth of channel of 3½ feet from Smith Mills, 54 miles above the mouth, to Cheraw, 118 miles farther up, still no effort has been made to comply with the terms of the project by removing such sand shoals by dredging or otherwise upon which there is a depth of less than 3½ feet at dead low water. This depth does really exist to the Wilmington, Columbia and Augusta Railroad Bridge, 49 miles above Smith Mills, and the river steamers make their regular trips throughout the entire year to this point. From this point 69 miles farther upward to Cheraw, the head of navigation, there are several shoals having less water on them than the project calls for. During the low-water period of the river it frequently happens that the steamers are unable to get farther up than the railroad bridge mentioned. At such times the 69 miles of river to Cheraw are without means of transportation, which is a great hardship to the people living along its banks, they having to haul their produce and supplies long distances to and from market. This upper portion of the river flows through an exceedingly fertile section of the State, and were it open for navigation during the low-water season of the year commerce would be greatly increased and the people very much benefited. The shoals in the river thus blocking navigation are composed of sand and pebbles, and could be without much difficulty removed by a scoop or suction dredge. The formation of these shoals was probably originally caused by the accumulation of sand around fallen timber. Should both the sand and fallen timber be removed, it is believed that several years would elapse before the formation of shoals would again occur in these portions of the river. In 1889 the shoals were all surveyed and plotted. From these surveys it is calculated that to secure a depth of 3½ feet and a width of at least 60 feet would require the removal of 199,629 cubic yards of material.

RECOMMENDATIONS.

It is respectfully recommended that the snagging of channel and clearing of banks be continued as heretofore. The stoppage of this work for any considerable length of time would soon render the river almost if not quite impassable by fallen timber. After the completion of the project there will probably be required about $8,000 per year for maintenance. The Great Pedee is one of the most important rivers in the State, and one of its main arteries of trade.

* * * * * * *

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 5.

IMPROVEMENT OF MINGO CREEK, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1106, Annual Report for 1887.
For map of creek see page 1202, Annual Report for 1890.

WORK OF PAST YEAR.

The snag boat was run over the creek at intervals to keep it clear. Steamers have used the creek safely by night as well as by day. At the close of the year there were no funds left for the maintenance of this improvement. No funds have been appropriated since 1894. The project has been satisfactorily completed for the estimated cost, but without funds for its maintenance by occasional snagging the creek will be again obstructed by snags. About $2,000 a year would keep the stream in good condition. As Congress has not shown the intention of maintaining this improvement and no funds are on hand, no further reports will be submitted.

For details of work done reference is made to the appended report of my assistant engineer, Mr. Reid Whitford, who has been in local charge.

This creek is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$776.14
June 30, 1897, amount expended during fiscal year	776.14

For this improvement the following appropriations have been made:

By act of Congress—	
Of August 11, 1888	$5,000
Approved September 19, 1890	5,000
Approved July 13, 1892	3,000
Of August 17, 1894	4,000
Total	17,000

Total expenditures, including June 30, 1897, $17,000.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Spirits of turpentine.....barrels..	11,000	2,750	$220,000	12,000	3,000	$192,000
Rosin .....do....	66,000	11,550	145,000	70,000	14,000	175,000
Crude turpentine.....do....	5,000	1,000	25,000	5,000	1,000	20,000
Wood .....cords..	6,000	6,000	15,000	10,000	10,000	30,000
Staves	350,000	700	1,400	750,000	1,750	3,500
Hoop poles.....	50,000	50	5,000	50,000	50	6,000
Cotton.....bales..	4,500	1,125	202,500	7,000	1,750	245,000
Shingles	600,000	300	5,000	200,000	30	1,400
Other produce, including wool.....	.....	400	20,000	.....	450	25,000
Lumber, cross-ties, etc	.....	12,000	60,000	.....	15,000	75,000
Total	.....	35,875	698,900	.....	47,030	772,900
INWARD FREIGHTS.						
General merchandise	.....	7,000	350,000	.....	8,250	412,500
Grand total.....	.....	42,875	1,048,900	.....	55,280	1,185,400

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Spirits of turpentine .....barrels..	12,000	2,400	$216,000	10,000	2,500	$180,000
Rosin .....do....	70,000	14,000	185,000	60,000	15,000	120,000
Crude turpentine.....do....	5,000	1,250	15,000	4,000	1,000	8,000
Cypress, oak, and pine staves.....	75,000	190	4,500	750,000	300	7,500
Wood .....cords..	12,000	12,000	36,000	15,000	15,000	45,000
Hoop poles.....	25,000	25	4,500	75,000	75	7,500
Cotton.....bales..	7,500	1,850	300,000	5,000	1,000	200,000
Shingles	700,000	350	5,600	8,000,000	15,000	20,000
Other produce.....	.....	600	35,000	.....	500	30,000
Lumber, timber, etc.....	.....	45,000	200,000	.....	50,000	225,000
Total	.....	77,665	1,001,600	.....	100,375	838,000
INWARD FREIGHTS.						
General merchandise	.....	17,000	750,000	.....	14,000	585,000
Grand total.....	.....	94,665	1,751,600	.....	114,375	1,423,000

Articles.	1895.			1896.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Spirits of turpentine.....barrels..	12,000	2,250	$156,000	12,000	3,000	$180,000
Rosin .....do....	70,000	12,250	157,500	70,000	14,000	175,000
Crude turpentine.....do....	3,000	420	9,000	2,500	500	6,250
Wood .....cords..	25,000	25,000	25,000	10,000	10,000	20,000
Cotton.....bales..	4,950	1,237	148,500	5,000	1,250	200,000
Shingles	1,000,000	500	8,000	100,000	50	1,200
Lumber, timber, etc.....	.....	75,000	375,000	.....	100,000	400,000
Other produce, wool, etc.....	.....	300	18,000	.....	325	22,000
Total	.....	116,957	897,000	.....	129,125	1,004,450
INWARD FREIGHTS.						
General merchandise	.....	20,000	625,000	.....	40,000	810,000
Grand total.....	.....	136,957	1,522,000	.....	169,125	1,814,450

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Spirits turpentine.....barrels..	12,000	3,000	$200,000
Rosin.....do....	85,000	17,000	155,000
Crude turpentine.....do....	1,500	400	3,500
Wood.....cords..	5,000	5,000	10,000
Cotton.....bales..	4,500	1,125	135,000
Shingles.....number..	750,000	375	3,750
Lumber, timber, etc.....	.....	100,000	350,000
Other produce, wool, etc.....	.....	375	25,000
Total.....	.....	127,275	882,250
INWARD FREIGHTS.			
General merchandise, including guano.....	.....	65,000	850,000
Grand total.....	.....	192,275	1,732,250

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on Mingo Creek, South Carolina, for the fiscal year ending June 30, 1897:

Work consisted in removing obstructions from the channel and overhanging trees from the banks, and was carried on between the mouth of the creek and 13 miles above. The following obstructions were removed: From the channel, 76 logs, 23 stumps, 103 large snags. From the banks 107 trees were cut. Of the amount expended seven-tenths were used on the channel and three-tenths on the banks. Each obstruction cost approximately 72 cents.

REMARKS.

The improvement of Mingo Creek is a great benefit to commerce, but even after this work is completed at least $2,000 per year will be required to maintain the present width and depth of the channel. Otherwise it will soon become obstructed by the accumulation of fallen timber.

RECOMMENDATIONS.

It is respectfully recommended that a sufficient amount be asked for yearly to keep the creek open and permit steamers to run uninterruptedly as they do now throughout the lowest stages of the water.

EMPLOYEES.

The United States employees who have worked on this stream have been, as usual, very faithful in the discharge of their duties.

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 6.

IMPROVEMENT OF WINYAH BAY, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For original project see Annual Report of Chief of Engineers, 1885, page 1164. For report by Board of Engineers see Annual Report for 1889, page 1114. For description of previous operations see Report for 1894, page 1059; of 1895, page 1349; of 1896, page 1165.

WORK OF PAST YEAR.

The sodding of the mud dike was continued by hired labor for a time, and then discontinued until the final project and specifications for the continuing contract authorized by the act of June 3, 1896, were prepared and approved.

On September 4, 1896, the Chief of Engineers submitted a preliminary project, which was approved by the Secretary of War on December 11, 1896. In accordance with instructions of December 15, 1896, specifications were prepared in this office and submitted to the Chief of Engineers on December 31, 1896. After full consideration these specifications had been so drawn as to cover three separate continuing contracts. The first was for constructing the two jetties; the second, for completing the mud dike; the third, for building a thoroughly equipped modern ocean-going pump dredging steamer.

The jetty contract called for about 700,000 tons of stone and about 250,000 square yards of mattress. The general construction of the jetties laid down in these specifications is similar to that used at Charleston, S. C. Care was taken to so word these specifications as to permit the officer in local charge to completely regulate the order and location of work as actual results attained from time to time afforded additional data. Under no other system can a work of this magnitude be expected to reach a satisfactory conclusion without unnecessary expenditures.

The contract for completing the mud dike called for about 40,000 cubic yards of mud filling; about 50,000 square yards of sodding, and the construction of one dam. The extension of the dike rests on a peaty soil, and to prevent the percolation of water a suitable muck ditch 8 feet wide and 2 feet deep is to be dug at the toe of the seaward slope of the dike for the whole length, 2,600 feet, of the extension. The sodding covered by the specifications is for the protection of the entire seaward slope of the dike wherever such protection of the slope is needed.

The dredging steamer is specified to be 135 feet long, 30 feet beam, 11 feet depth of hold, draft light, not to exceed 7 feet, and to carry 250 cubic yards of sand on a draft of 10 feet. She is to have a speed of not less than 10 miles an hour in still water under ordinary steam pressure, the speed being determined by a four hours' trial run in deep water, using a tested patent log.

Bids were opened on March 12, 1897. The contract for the mud dike was approved by the Chief of Engineers on June 7, 1897. The work is to begin on or before October 1, 1897. An earlier start was impracticable on account of the very unhealthful surroundings.

The contract for constructing the jetties was approved by the Chief of Engineers on June 10, 1897. It calls for work to begin on July 1, 1897.

The contract for constructing the steam-pump dredge was awarded to The Bucyrus Company on the condition that they submit complete supplementary specifications meeting with the approval of the engineer officer in charge. These were to have been submitted with their original bid according to the formal specifications of March 12, 1897, but the company claimed that they had not time to prepare them before the opening. To insure the best return for the money expended, a personal inspection of the dredge *Gen. C. B. Comstock*, built by this company for the Galveston improvement, was made. She was working twenty-four hours a day on the Galveston Bar. An entire day was spent aboard,

and careful note was taken of her good points as well as her weaknesses. Based on this information and the thorough knowledge of the dredge *Charleston*, which was both built and operated under this office, a set of detailed specifications was drawn up and discussed at South Milwaukee, Wis., by myself and the president and chief engineer of The Bucyrus Company.

On June 21, 1897, the above company suggested certain modifications in these specifications and submitted preliminary drawings of the hull and machinery. These drawings were returned to The Bucyrus Company with further suggestions and modifications in sufficient detail to permit their preparing the final drawings and full detailed specifications. As soon as these are received the contract will be drawn and submitted for final approval by the Chief of Engineers.

Changes during the year made it advisable to modify the project of September 4, 1896, and accordingly a new project was submitted by the Chief of Engineers on March 25, 1897, for completing the improvement under the above continuing contracts. This project was subsequently approved by the Secretary of War.

A full and complete survey of the bar and the shore lines of North Island and of South Island as far as Santee Point was made in May and June, 1897. Comparing this survey with that made a year ago, it is seen that the Bottle Channel has deepened somewhat and widened greatly under the influence of the partially completed portion of the north jetty. The shore of South Island has cut away rapidly, making it imperative to begin work as soon as possible on the inshore end of the south jetty. The sundry civil act of June 4, 1897, provided $350,000 for this improvement, thus insuring the early beginning of active work. It is proposed to apply a part of this appropriation to completing and closing up the contracts for the mud dike and the dredging steamer, and to expend the balance in constructing the inner portion of the south jetty to a sufficient height and for a sufficient distance to throw the current well off the South Island shore, and to raise and extend the north jetty as far as the funds will permit. For details of the work done, reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has been in local charge during the year and has done his duty well.

This bay is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended		$29,044.90
Amount appropriated by sundry civil act approved June 4, 1897		350,000.00
		379,044.90
June 30, 1897, amount expended during fiscal year		12,183.04
July 1, 1897, balance unexpended		366,861.86
July 1, 1897, outstanding liabilities	$787.19	
July 1, 1897, amount covered by uncompleted contracts	1,335,499.43	
		1,336,286.62
Amount (estimated) required for completion of existing project		1,701,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		400,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Amount and date of all appropriations for this work are as follows:

By act of Congress—	
Approved August 5, 1886	$18,750
Of August 11, 1888	100,000
Approved September 19, 1890	100,000
Approved July 13, 1892	100,000
Of August 17, 1894	110,000
Passed June 3, 1896	20,000
Approved June 4, 1897	350,000
Total	798,750

Total expenditures including June 30, 1897, $431,888.14.

Abstract of proposals for constructing jetties at Winyaw Bay, South Carolina, received in response to advertisement dated Charleston, S. C., February 10, 1897, and opened March 12, 1897, by Capt. Frederic V. Abbot, Corps of Engineers.

Name of bidder.	Large stone.		Small stone.		Ballast.	
	Per ton.	Aggregate.	Per ton.	Aggregate.	Per ton.	Aggregate.
Alabama Dredging and Jetty Co	$1.90	$285,000	$1.90	$665,000	$1.90	$380,000
Stewart Contracting Co	1.89	283,500	1.89	661,500	1.89	378,000
McArthur Bros. & Co	1.96	294,000	1.94	679,000	1.94	388,000
Geo. W. Egan & Co	2.22	333,000	2.22	777,000	2.22	444,000
Jno. L. Grim	2.18	327,000	2.18	763,000	2.18	436,000
Jacob Friday & Sons	2.00	300,000	2.00	700,000	2.00	400,000
R. G. Ross	1.57	235,500	1.57	549,500	1.57	314,000

Name of bidder.	Mattress.					
	First design.		Second design.		Third design.	
	Square yard.	Aggregate.	Square yard.	Aggregate.	Square yard.	Aggregate.
Alabama Dredging and Jetty Co	$0.65	$54,166.45	$0.65	$54,166.45	$0.65	$54,166.45
Stewart Contracting Co	.60	49,999.80	.62	51,666.46	.60	49,999.80
McArthur Bros. & Co	.90	74,999.70	.94	78,333.02	.92	76,666.36
Geo. W. Egan & Co	.62	51,666.46	.68	56,666.44	.67	55,833.11
Jno. L. Grim	.95	79,166.35	.95	79,166.35	.95	79,166.35
Jacob Friday & Sons	.90	74,999.70	.90	74,999.70	.88	73,333.04
R. G. Ross	.57	47,499.81	.57	47,499.81	.57	47,499.81

GRAND TOTALS.

Alabama Dredging and Jetty Co	$1,492,499.35
Stewart Contracting Co	1,474,666.06
McArthur Bros. & Co	1,500,999.08
Geo. W. Egan & Co	1,718,166.01
Jno. L. Grim	1,763,499.05
Jacob Friday & Sons	1,623,833.44
R. G. Ross	1,241,499.43

Abstract of proposals for completing mud dike at South Island, South Carolina, received in response to advertisement dated Charleston, S. C., February 10, 1897, and opened March 12, 1897, by Capt. Frederic V. Abbot, Corps of Engineers.

Name of bidder.	Muck ditch.		Sodding.		Dike fill.		Dam.	Grand Total.
	Per linear foot.	Total.	Per square yard.	Total.	Per cubic yard.	Total.		
P. Sanford Ross	$0.00	$234	$0.16	$8,000	$0.297	$11,880	$1,300	$21,414
F. C. Fishburne	.20	520	.30	15,000	.30	12,000	1,600	29,120
James A. Bryan	.25	650	.19¼	9,875	.24	9,600	875	21,000
H. S. Cordes	.20	520	.27	13,500	.27	10,800	1,240	26,060
George W. Egan and Charles G. Boehman	.11	286	.22	11,000	.23	9,200	998	21,484

Abstract of proposals for constructing steam pump dredge, received in response to advertisement dated Charleston, S. C., February 10, 1897, and opened March 12, 1897, by Capt. Frederic V. Abbot, Corps of Engineers.

Name of bidder.	Price for dredge.
Thompson C. Gill & Co	a $79,000
The Bucyrus Co	73,800
John L. Grim	78,000

a Informal bid by telegraph.

List of contracts in force.

Name of contractor.	Date of approval.	Date of beginning.	Date of expiration.
James A. Bryan	June 7, 1897	Oct. 1, 1897	May 1, 1898
Roderick G. Ross	June 10, 1897	July 1, 1897	July 1, 1902

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Georgetown, S. C., from January 1, 1888, to December 31, 1896.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1888	352	124,155	2,818	2	479	14	1	81	8	355	124,715	2,840
1889	365	128,705	2,920	2	424	10	1	149	7	368	129,278	2,943
1890	385	165,785	3,150	6	1,346	42	1	106	6	392	167,237	3,198
1891	420	191,651	4,035	1	245	7	2	292	14	423	192,188	4,056
1892	453	215,087	4,610	1	249	7	2	439	14	456	215,775	4,631
1893	506	318,156	4,813	1	241	7	....	.....	.....	507	318,397	4,820
1894	567	337,520	5,240	4	897	29	3	622	21	574	339,039	5,290
1895	581	339,020	5,386	2	467	14	....	.....	.....	583	339,487	5,400
1896	563	397,763	5,407	....	.....	.....	....	.....	.....	563	397,763	5,407

CLEARED.

1888	342	121,715	2,735	8	1,835	55	1	81	8	351	123,631	2,798
1889	357	126,965	2,856	6	1,494	45	1	149	7	364	128,608	2,908
1890	372	160,458	3,069	9	1,978	68	2	355	13	383	162,791	3,145
1891	384	164,562	3,986	9	2,719	69	1	149	7	394	167,429	4,062
1892	396	187,963	4,094	5	1,173	33	3	537	19	404	189,673	4,146
1893	428	193,763	4,318	4	985	27	1	174	7	433	194,922	4,352
1894	472	207,447	4,626	8	2,035	56	3	611	21	483	210,093	4,703
1895	491	209,341	4,786	3	624	21	....	.....	.....	494	209,965	4,807
1896	459	201,561	4,580	3	736	23	....	.....	.....	462	202,297	4,603

Commerce, foreign and domestic.

Year.	Value of exports.	Value of imports.	Duties collected.
1888	$3,125,000	$2,750,000	$32.44
1889	3,265,000	2,975,000	.....
1890	3,454,000	3,175,000	60.54
1891	3,291,407	6,895,000	11.64
1892	3,989,040	7,347,568	14.82
1893	4,100,040	7,349,575	7.23
1894	4,364,159	7,821,123	45.60
1895	4,397,791	7,890,046	236.72
1896	4,934,762	7,074,691	.....

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Total commerce.

Year.	Amount.	Year.	Amount.
1888	$5,875,000	1893	$11,449,615
1889	6,240,000	1894	12,185,282
1890	6,629,000	1895	12,287,837
1891	9,809,077	1896	12,009,453
1892	11,336,608		

A. McP. Hamby, Jr., *Collector.*

COMMERCIAL STATISTICS, WINYAH BAY AND GEORGETOWN, S. C.

	1896.			1897.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Passengers	10,000	.....	$20,000	9,000	.....	$18,000
Cotton.....bales..	10,000	2,500	400,000	8,000	2,100	320,000
Rough rice.....bushels..	210,000	4,620	210,000	300,000	6,600	300,000
Clean rice.....barrels..	20,000	4,400	800,000	30,000	5,870	405,000
Rice flour.....bushels..	15,000	150	2,250	18,000	175	2,700
Rosin, pitch, and tar.....barrels..	160,000	32,800	240,000	140,000	28,000	210,000
Spirits turpentine.....do....	27,000	6,750	378,000	22,000	5,500	308,000
Cross-ties	252,000	17,640	100,800	100,000	15,000	25,000
Lumber.....feet B. M..	30,500,000	50,833	457,500	20,000,000	38,124	300,000
Shingles	20,300,000	10,150	121,800	15,000,000	7,614	37,500
Clams.....barrels..	4,000	1,000	10,000	1,500	375	3,750
Canned goods, pickles, etc	.....	83	10,000	.....	83	10,000
Poultry and eggs	.....	1	1,000	.....	1	1,000
Wool and hides	.....	7	2,000	.....	7	2,000
Miscellaneous	.....	625	25,000	.....	625	25,000
General merchandise, grain, machinery, and manufactured products	.....	10,000	1,000,000	.....	10,000	1,100,000
Total	.....	141,559	3,278,350	.....	120,074	3,067,950
INWARD FREIGHTS.						
General merchandise, fertilizers, machinery, rough rice, etc	.....	29,500	2,950,000	.....	29,300	2,750,000
Grand total	.....	171,059	6,228,350	.....	149,374	5,817,950

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

United States Engineer Office,
Georgetown, S. C., June 30, 1897.

Captain: I have the honor to report as follows on Winyaw Bay, South Carolina, for fiscal year ending June 30, 1897:

There was no contract work done during the year. Twenty-five spur jetties on South Island Beach, placed there to collect sand on the high-water line, have been kept in repair. A break on South Island Beach was stopped by building bulkheads across it with sheet piles. This work was broken up by a severe storm, which occurred just before the repairs were finally completed. No further attempt was made to close up this break, as it was thought it would be better to wait until sufficient stone could be economically secured for the purpose, as any wooden structure placed there would not probably be permanent.

The grass sod on South Island Dike has been kept watered so as to promote its growth. Minor surveys of shore lines, etc., have been made from time to time during the year. This month the survey of the entrance to Winyaw Bay, including Bottle Channel, was made, and the whole area thoroughly and carefully sounded. A full map of same is sent herewith in another package.

REMARKS.

By reference to the accompanying map of the survey just made, a marked beneficial change will be noticed at the outer bar entrance to Bottle Channel in comparison with last year's survey. The movement of sand has been very decided at that

particular place, the channel having widened from 100 feet to 625 feet during the past twelve months. The least depth in this channel was 9 feet at mean low water. This improvement is worthy of consideration when it is remembered that for the past several years the depth was from 7 to 8 feet at the same stage of water. From the above it would appear that the action of the north jetty is all that could be desired so far as it has been extended. Forming a hasty conclusion from the past year's improvement, it does seem that if after the north jetty is built up to its full dimensions, with the aid of a suction dredge, none of the south jetty will be needed to secure the depth wanted on the bar, but just enough of it built to protect the South Island shore from further erosion.

RECOMMENDATIONS.

It is respectfully recommended that work be continued on the north jetty by extending it seaward, and at the same time raise it and build it to full dimensions from the high-water line on shore as provided for by the approved project, so as to guard against the possibility of the sand on the northeast side of the jetty being swept over its crest during the prevalence of northeast gales, and thus lessen the depth of the main channel. It is also respectfully recommended that the mud dike on South Island be completed as soon as possible, and that the south jetty be begun without any unnecessary delay, and extended just far enough seaward to protect the South Island Beach; that it be stopped at this point to await the final completion of the north jetty, so as to ascertain after watching the action of the latter to determine whether or not a further extension of the south jetty will be absolutely needed to secure the improvement desired.

It is also further recommended that as an aid to the work of the jetties, a suction dredge of suitable draft and dimensions begin operations in Bottle Channel so as to secure the desired depth there at an earlier date.

EMPLOYEES.

* * * * * * *

In the necessary absence of the writer from a part of the annual survey, Mr. William Alden James had full charge, and directed the work with ability and dispatch.

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Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 7.

IMPROVEMENT OF SANTEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For description of river, see page 916, Annual Report for 1880. For full history of work, see page 1036, Annual Report for 1886. For new project, see page 1184, Annual Report for 1889. For map of river, see page 1186, same report. For statement showing comparative cost of dredging by contract and by hired labor, see pages 1171 and 1172, Annual Report for 1896.

MISCELLANEOUS.

In carrying out the projects of 1880 and 1889, two canals have been dug connecting Winyaw Bay and Santee River. The first, or Mosquito Creek Canal, is 30 feet wide, 3 feet deep at low water, about 7 miles long, and cost about $95,000. The first cut of the second, or Estherville-Minim Creek Canal, 4.8 miles long, 50 to 60 feet wide, and 6 to 8 feet deep at low water, was completed all the way through by June 30, 1897, its entire cost being about $130,000. Much work, in no way

connected with the actual excavation, was necessary in cutting a canal through this highly cultivated rice-producing region. Expenditures for these purposes must be considered in order to arrive at a just estimate of the actual cost of dredging.

The right of way through the Estherville plantation was given on the condition that the irrigation and drainage destroyed in the cutting of the canal should be replaced by another system equally good. The aggregate expenditures for this purpose have been about $23,000, and the United States holds a recorded release from any further charges on this account.

To avoid an expense as great or greater at the other end of the canal, the Daisy Bank plantation was purchased at a cost of $8,000, including $500 expended for legal advice. Three-fifths of the length of the canal is within the boundaries of this plantation. A large quantity of long leaf, unbled yellow pine lumber has been cut from this land, sawed by the sawmill owned by the United States, and used in making repairs to, and new constructions for, the United States plant.

The canal intersects two roads which were formerly protected by the rice banks of the adjoining plantations. These roads were submerged at high tide by the large volume of water coming through the United States canal. To restore these roads to a condition such that they could be used for travel, much embankment and other expensive work was necessary. This has been accomplished by the expenditure of about $25,000, and the United States now holds a release from all future claims for maintenance.

Other bank and ditch work incidental to the protection of growing rice crops on adjacent plantations has cost about $5,000.

A snag boat for use on the Santee River has been nearly completed for about $5,000.

The aggregate of the above expenditures for the purposes named is $66,000.

The balance, $64,000, has been expended in the actual excavation of the canal.

COMPARISON OF COST BY CONTRACT AND HIRED LABOR.

Contract dredging was tried, the lowest bid being 37½ cents per cubic yard, and even at this price the contractor failed to complete his contract. Under these circumstances permission was obtained to build a dredge and do the work by hired laber. A large and a small dredge have been built for an aggregate amount of about $25,000. With these two dredges 481,929 cubic yards of material (sand, mud, and clay, including 4,254 stumps) has been excavated and placed on the banks well back from the edge. Charging the whole of this plant to dredging, the actual cost of excavation per cubic yard has been $0.133. The plant has been maintained in thoroughly good condition and is now available for the completion of the canal and other work in the district.

At 35 cents, the lowest contract price per cubic yard bid for this work or for similar dredging in the Mosquito Creek Canal, 4 miles distant, the cost of this first cut would have been $168,675.15, as compared with the actual expenditure of about $64,000. The execution of this work by hired labor therefore resulted in a saving to the United States of nearly $105,000 in cash, plus the value of the efficient dredging plant it now possesses.

EFFECT ON ADJACENT RICE PLANTATIONS.

The completion of the first cut has resulted in an almost continuous flow of water at all stages of the tide from Santee River to Winyaw Bay. The rice planters on Minim Creek had feared a contrary direction of flow, which would have introduced salt water from Winyaw Bay into the fresh water of Minim Creek, from which they irrigate their rice fields. This would have ruined their plantations. As long as the United States maintains its present canal banks above high water, no injury can result to these plantations.

Adjacent to the Government land (the former Daisy Bank plantation) and to the west of it, lies the Hopewell plantation, owned by Mr. William Miles Hazzard. The large canal which was formerly used to drain both of these plantations forms the boundary between them. Under the State law neither party can destroy the usefulness of this canal for drainage purposes without properly recompensing the other party. This boundary canal is now as available as ever for the drainage of Hopewell plantation, and will remain so as long as the western bank of the navigable Government canal remains high enough to keep the Daisy Bank lands dry at high water. This will require constant maintenance, which will cost about $2,000 a year. The United States must either maintain the banks of its navigable canal or be justly liable in damages to Mr. Hazzard. A third solution of the question is offered voluntarily by him. He will give the United States a release from all future claims if the central canal through Hopewell is "slushed" out. This would make the drainage of his lands entirely independent of that of the Daisy Bank lands. A careful estimate shows that this can be done for a single expenditure of $2,000. The justice and economy of this method are apparent. The "slushing" or clearing out and deepening at Government expense of a canal not on lands owned by the United States requires antecedent authority of Congress, and it is strongly recommended that this authority be given by the insertion in the next river and harbor bill of a clause in the item for Santee River, explicitly permitting this expenditure of $2,000 on condition that the full release from future claims be properly executed and recorded by the owner of Hopewell plantation. The bill should also contain a clause permitting the same arrangement with the owner of the plantation bounding Daisy Bank lands on the east if he will give a similar release and have it properly recorded. The cost of this "slushing" will be the same as for Hopewell plantation.

SNAGGING IN SANTEE RIVER.

Some snagging was done between 43 and 98 miles above the mouth of the Santee River itself, as snags had appeared there in sufficient quantity to impede navigation.

For details of work done during the year reference is made to the appended report of my assistant engineer, Mr. Reid Whitford. The table of costs given in his report is of especial value. He has had local charge of all work on this canal from the beginning, has actually constructed and assembled both dredges and their dump scows, and has set up and operated the sawmill. The large amount that the United States has saved by making this cut by hired labor is in a great measure due to his constant presence.

This river is in the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$54,113.81
June 30, 1897, amount expended during fiscal year	29,126.23
July 1, 1897, balance unexpended	24,987.58
July 1, 1897, outstanding liabilities	1,737.72
July 1, 1897, balance available	23,249.86
Amount (estimated) required for completion of existing project	202,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881	$22,000	Approved July 13, 1892	30,000
Passed August 3, 1882	20,000	Of August 17, 1894	40,000
Approved July 15, 1884	15,000	Passed June 3, 1896	48,000
Approved August 5, 1886	18,750		
Of August 11, 1888	24,000	Total	247,750
Approved September 19, 1890	30,000		

Total expenditures, including June 30, 1897, $222,762.42.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales	20,000	5,000	$850,000	22,000	5,500	$800,000
Rosin.....barrels	140,000	24,500	175,000	150,000	30,000	185,000
Spirits of turpentine.....do	25,000	4,687	350,000	26,000	5,100	355,000
Timber.....pieces	12,000	18,000	60,000	21,000	25,200	90,000
Shingles	3,000,000	1,500	15,000	3,500,000	1,750	17,500
Lumber.....feet	2,000,000	3,333	20,000	2,000,000	2,000	20,000
Railroad ties	23,000	1,610	6,900	35,000	2,800	10,500
Wool.....pounds	50,000	25	15,000	50,000	25	12,500
Hides.....do	15,000	8	1,500	20,000	10	1,600
Seed oats.....bushels	7,000	210	4,200	8,000	184	4,800
Rice.....do	100,000	2,200	150,000	140,000	3,220	175,000
Staves	500,000	500	2,500	400,000	1,000	2,200
Wood.....cords	10,000	10,000	12,000	12,000	12,000	15,000
Game and fish	.....	15	1,500	.....	34	1,700
Total	.....	71,588	1,663,600	.....	88,823	1,690,800
INWARD FREIGHTS.						
Fertilizers	.....	7,500	225,000	.....	4,600	230,000
Groceries, provisions, etc	.....	11,667	350,000	.....	6,600	330,000
Dry goods	.....	4,000	225,000	.....	4,500	225,000
Boots, shoes, etc	.....	4,000	200,000	.....	4,000	200,000
Hardware, implements, machinery	.....	1,500	80,000	.....	2,000	100,000
Grand total	.....	100,255	2,743,600	.....	110,523	2,775,800

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	22,000	5,500	$700,000	15,000	4,200	$575,000
Rosin.....barrels..	161,000	35,000	191,000	135,000	27,000	164,000
Spirits of turpentine.....do....	26,450	5,200	361,000	23,000	4,700	318,000
Timber.....pieces..	23,000	39,400	131,000	28,000	32,400	143,000
Shingles.....	.....	.....	.....	4,000,000	2,000	20,000
Lumber.....feet..	.....	.....	.....	2,500,000	2,500	25,000
Railroad ties.....	46,000	3,500	13,800	62,000	4,400	18,600
Wool.....pounds..	50,000	25	12,500	50,000	25	12,500
Hides.....do....	20,000	10	12,000	26,000	13	2,000
Seed oats.....bushels..	10,000	302	6,000	11,000	256	4,950
Rice.....do....	.....	.....	.....	80,000	1,600	48,000
Rice, rough.....do....	125,000	30,000	150,000	.....	.....	.....
Staves.....	500,000	500	2,000	400,000	1,000	2,200
Wood.....cords..	10,000	10,000	12,500	15,000	15,000	15,000
Game and fish.....	.....	45	2,300	.....	34	1,750
Total.....	.....	102,482	1,594,600	.....	95,128	1,350,000
INWARD FREIGHTS.						
General merchandise.....	.....	21,700	1,085,000	.....	.....	.....
Fertilizers.....	.....	.....	.....	.....	4,800	250,000
Groceries, provisions, etc.....	.....	.....	.....	.....	6,000	300,000
Dry goods.....	.....	.....	.....	.....	4,000	200,000
Boots, shoes, etc.....	.....	.....	.....	.....	3,500	175,000
Hardware, implements, etc.....	.....	.....	.....	.....	2,000	100,000
Grand total.....	.....	124,182	2,679,600	.....	115,428	2,375,000

Articles.	1895.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton.....bales..	15,000	3,750	$450,000
Rosin.....barrels..	140,000	24,500	168,000
Spirits of turpentine.....do....	20,000	3,750	260,000
Timber.....pieces..	24,000	36,000	120,000
Lumber.....feet B. M..	3,000,000	3,000	30,000
Railroad ties.....	60,000	4,400	15,000
Wool.....pounds..	60,000	30	16,500
Hides.....do....	12,000	6	500
Seed oats.....bushels..	8,000	184	4,000
Rice, rough.....do....	160,000	3,520	120,000
Staves.....	400,000	1,000	4,000
Wood.....cords..	15,000	15,000	22,000
Game and fish.....	.....	50	2,500
Shingles.....	5,000,000	2,500	20,000
Total.....	.....	97,690	1,224,800
INWARD FREIGHTS.			
General merchandise, fertilizers, groceries, provisions, dry goods, hardware, implements, etc.....	.....	20,000	1,000,000
Grand total.....	.....	117,690	2,224,800

Articles.	1896.			1897.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	1,400	3,500	$427,000	15,000	4,000	$480,000
Rosin.....barrels..	140,000	28,000	172,000	150,000	30,000	175,000
Spirits turpentine.....do....	2,500	6,250	375,000	28,000	7,000	395,000
Timber.....pieces..	24,000	48,000	96,000	12,000	24,000	80,000
Shingles.....	2,000,000	1,000	8,000	2,000,000	1,000	8,000
Lumber.....feet B. M..	2,500,000	4,166	25,000	2,500,000	2,500	25,000
Railroad ties.....	60,000	4,200	15,600	50,000	3,500	12,500
Wool.....pounds..	50,000	25	6,000	70,000	35	10,500
Hides.....do....	28,000	14	1,500	2,900	14	1,740
Seed oats.....bushels..	10,000	230	4,000	12,000	192	4,200
Rice, rough.....do....	100,000	2,200	95,000	130,000	21,125	130,000
Staves.....	400,000	400	2,000	300,000	600	22,000
Wood.....cords..	15,000	15,000	15,000	15,000	17,250	15,000
Game and fish.....	.....	150	7,500	.....	90	9,000
Total.....	.....	113,135	1,249,600	.....	111,306	1,367,940
INWARD FREIGHTS.						
Fertilizers.....	.....	5,000	200,000	.....	7,500	210,000
Dry goods.....	.....	3,500	175,000	.....	3,700	135,000
Groceries, provisions, etc.....	.....	6,000	280,000	.....	7,000	187,000
Boots, shoes, etc.....	.....	3,500	150,000	.....	1,500	100,000
Hardware, machinery, etc.....	.....	3,000	150,000	.....	3,200	160,000
Grand total.....	.....	134,135	2,204,600	.....	134,206	2,159,940

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on Santee River, South Carolina, for year ending June 30, 1897:

Dredge No. 1, owned and operated by the United States, resumed work November 3, 1896, at Station 186+50, and on March 31, 1897, completed the first cut, 50 to 60 feet wide and about 6 to 8 feet deep at low tide, to Minim Creek, having cut a distance of 6,950 linear feet, removing 94,517 cubic yards of material and 657 stumps. Immediately after reaching Minim Creek the dredge turned back and commenced to reexcavate certain portions of the first cut, which had become shoaled up from caving banks and other causes. In this way there were removed 62,293 cubic yards of material and 44 stumps, making a total of 156,810 cubic yards and 701 stumps for the year. Excavated ahead of dredge, to facilitate its progress, at intervals between Station 187 and Minim Creek, 30,821 yards of material.

As the dredge approached Minim Creek the hard, compact sand underlying the mud surface became exceedingly difficult to dig, the wear on the machinery being intense, several serious breakdowns occurring, but they were promptly repaired, and work again progressed after a short delay. Map of the canal is sent in another package, showing the amount of work so far completed and that left to be done.

Seven hundred and fifty linear feet of Daisy Bank roadway embankment was dressed to a bottom width of 36 feet, top width 16 feet, and height of 4 feet above high water, completing roadway embankment of 1,250 feet dressed.

The Government sawmill was kept in operation during most of the year, and sawed a total of 216,309 feet B. M. of lumber, which has been economically used in repairs in reconstruction of plant. One thousand one hundred and twenty-seven saw logs were cut; also 1,642½ cords of wood. There were hauled 1,191 saw logs to the mill and 1,436½ cords of wood to canal bank.

Dredge No. 2, which at first was temporarily equipped for building up the roadways, has been rearranged and a new outfit similar to that of dredge No. 1, but very much smaller and lighter, furnished by the Osgood Company, assembled and placed in the hull. This will make dredge No. 2 a very serviceable and handy machine for doing such work in the canal as would be expensive for dredge No. 1 to undertake. The Daisy Bank rice-field banks were built up and maintained to protect the neighboring cultivated rice fields from being flooded by water from the United States canal. This has proven a considerable item of expense. Additional shelters were constructed at the sawmill for the better protection of United States property, all of which was concentrated at that point. Travel was kept uninterrupted at the Estherville and Daisy Bank public roads where cut by the United States canal.

The Santee River proper becoming so badly obstructed in its channel b points 98 miles and 43 miles above its mouth as to seriously interfere with the tion of the regular river steamers, snagging operations were carried on a places. There were removed from the channel 144 logs, 80 stumps, and 19 snags. Each obstruction cost approximately 57 cents for removal. The improv of the channel thus made was so marked that captains and owners of steamers on the river expressed themselves strongly as being highly pleased with th done.

Cross sections and levels of the canal, together with minor surveys, were from day to day throughout the year. Daily tide-gauge observations were re at both the Santee and Winyah Bay ends of the canal, and the whole ca superintended.

To preserve the health of United States employees at the sawmill a cistern of and cement was constructed, having a capacity of about 8,000 gallons of pure ing water, at a cost of $471.39. Taking all the foregoing expenses into con ation, the cost of dredging per cubic yard, including stumps, was about 18½ The actual cost of dredging, excluding all work except dredging proper and in ing wear and tear and maintenance of plant and necessary superintendence about 5¼ cents per cubic yard, including stumps.

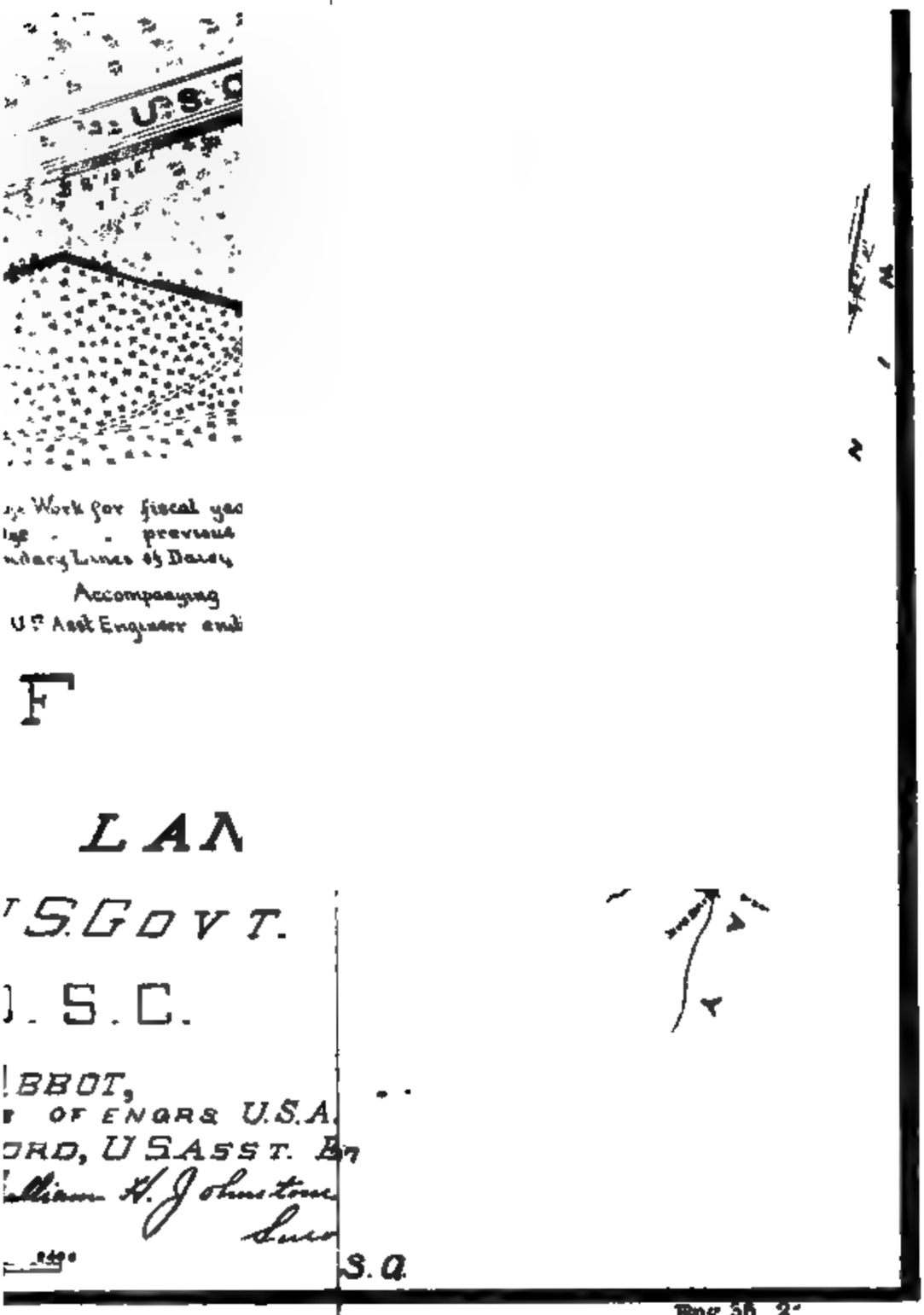
The aggregate amount expended by this office for the past year was $28,8 divided as follows:

Excavating 6,950 linear feet main canal, removing 94,517 cubic yards and 657 stumps, at a cost of 5¼ cents per cubic yard	$5,4
Redredging 9,475 linear feet main canal, removing 62,293 cubic yards and 44 stumps, at a cost of 5¼ cents per cubic yard	3,5
Excavating 30,821 cubic yards material ahead of dredge by hand, at a cost of 5¼ cents per cubic yard	1,7
Dressing 750 linear feet of Daisy Bank bank roadway embankment, at a cost of 20 cents per linear foot	1
Removing 421 obstructions from Santee River, at 57 cents each	2
Sawed 216,309 feet B. M. lumber, at $5 per M feet	1,0
Cutting 1,127 saw logs, at 5 cents each	
Hauling 1,191 logs to sawmill, at a cost of 40 cents each	4
Cutting 1,642½ cords wood for fuel, dredges, etc., at 40 cents per cord	6
Hauling 1,436½ cords wood to canal, at 40 cents per cord	5
Building up and maintaining Daisy Bank rice-field banks	4
Rearranging dredge No. 2 with new excavating equipment	1,8
Building additional shelters for United States property	5
New equipment for snag boat, Santee River	1,5
Constructing 8,000-gallon cistern at a cost of	4
Tide-gauge observations, cross sections, and minor surveys	5
Running launches and towing lighters in canal	8
Miscellaneous work, including minor repairs to and care of property and maintenance, and maintaining travel across canal	5,5
Superintendence, which includes assistant engineer's pay	2,9
Total	28,864.

The entire amount which has been expended on dredging strictly, with the begi ning of first cut to its completion by United States dredging plant, over a distance about 4.8 miles, was $23,766.08. The aggregate number of cubic yards of materi removed was 481,929, and the aggregate number of stumps removed was 4,2 which makes the average cost per cubic yard, including stumps, about 4.9 cents.

REMARKS.

As will be seen from the cost of excavation, the dredge owned and operated b the United States has done the work with decided economy and advantage to t Government. By way of comparison it may be well to mention here that previo contract work for excavations on this canal cost the United States Government 3 cents per cubic yard, exclusive of superintendence. The marsh land through whi for the most part the canal passes consists of mud and solid cypress stumps, a gre deal of tenacious pipe clay intermixed with hard, compact sand, which is naturall hard to penetrate with the dredge's dipper, and also exceedingly troublesome t dump. The dredge at present engaged on this work is an Osgood dipper or scoo machine, the capacity of whose scoop is about 1¼ yards when level full to the brim Mosquito Creek Canal has continued to be indispensable to the public tradin between the Santee River and Georgetown, awaiting the opening of Estherville Minim Creek Canal. As soon as the Estherville-Minim Creek Canal was opened int Minim Creek and the Santee River water was allowed to enter it, simultaneous tid observations were taken throughout several tides at ten different points betwee Minim Creek and Winyah Bay. These observations showed that the water fro Santee River ran continually over into Winyah Bay during nearly both the entir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ebb and flood tide. This proves that there is no possibility of Winyah Bay water ever entering Santee River through the canal. Since then other observations have been made by watching the flow of the water, and the whole tendency of it is toward Winyah Bay from Santee River.

RECOMMENDATIONS.

It is respectfully recommended that dredging the Estherville-Minim Creek route be continued by the dredge owned by the United States and hired labor, and that the canal be widened to 100 feet on top and 80 feet on bottom, maintaining not less than 6 feet at dead low water. It is also recommended that a good channel, with at least 80 feet width and 4 feet depth at dead low water, be secured and maintained in the Santee River proper, so as to permit steamers to run uninterruptedly throughout the whole year.

* * * * * * *

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 8.

IMPROVEMENT OF WATEREE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 914, Annual Report for 1880.
For map of river see page 1190, Annual Report for 1889.

WORK OF PAST YEAR.

The snag boat was run over the river at intervals during the year and kept the channel in good condition.

The appropriation of September 19, 1890, completed the amount that this improvement was estimated to cost. Since that time $10,000 has been appropriated for maintenance. While the river has actually been kept open for this sum, it has not been able to pay its fair share of the expenses of maintaining the snag boats. As previously reported, $6,500 per year is the amount that is needed for maintenance. For details of work done reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has been in local charge during the year.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$5,454.37
June 30, 1897, amount expended during fiscal year	2,660.96
July 1, 1897, balance unexpended	2,793.41
July 1, 1897, outstanding liabilities	256.60
July 1, 1897, balance available	2,536.81
Amount that can be profitably expended for maintenance in fiscal year ending June 30, 1899	6,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881	$8,000	Approved July 13, 1892	2,500
Passed August 2, 1882	15,000	Of August 17, 1894	2,500
Approved July 5, 1884	5,000	Passed June 3, 1896	5,000
Approved August 5, 1886	7,500		
Of August 11, 1888	12,000	Total	70,000
Approved September 19, 1890	12,500		

Total expenditures, including June 30, 1897, $67,206.59.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	415	104	$20,750	617	154	$21,[illegible]
Cotton-seed oil.....barrels..	270	54	3,780	395	91	4,[illegible]
Cotton-seed meal.....	.....	27½	605	135	135	2,[illegible]
Cotton-seed hulls.....	.....	10	25	.....	15	[illegible]
Cotton seed.....bushels..	1,000	15	300	.....	200	2,[illegible]
Rosin.....barrels..	1,000	175	1,250	3,500	700	7,[illegible]
Rice, rough.....bushels..	10,000	220	12,500	7,000	161	8,[illegible]
Total.....	.....	.....	39,210	.....	.....	46,[illegible]
INWARD FREIGHTS.						
General merchandise.....	.....	400	12,000	.....	788	39,[illegible]
Grand total.....	.....	1,005½	51,210	.....	2,244	86,[illegible]

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	570	143	$20,950	500	125	$15,[illegible]
Staves.....	.....	.....	.....	5,000	10	[illegible]
Rosin.....barrels..	18,000	3,600	36,000	1,400	196	1,[illegible]
Cotton-seed oil.....do....	470	112	8,190	378	91	4,[illegible]
Rice, rough.....bushels..	10,000	230	10,000	500	10	[illegible]
Cypress logs.....	.....	.....	.....	8,000	16,000	40,[illegible]
Fertilizers.....	.....	.....	.....	.....	200	4,[illegible]
Oak staves.....	7,000	17	42	.....	.....	.....
Hay.....{tons...	12	12	216	.....	.....	.....
Hay.....{bales..	.....	.....	.....	.....	6	[illegible]
Cotton seed.....tons..	483	483	10,626	.....	.....	.....
Linters.....	30	8	600	27	7	[illegible]
Cotton-seed hulls.....tons..	20	20	60	.....	25	[illegible]
Total.....	.....	4,625	86,684	.....	16,730	67,[illegible]
INWARD FREIGHTS.						
General merchandise and supplies.....	.....	1,617	31,045	.....	1,345	26,[illegible]
Grand total.....	.....	6,242	117,729	.....	18,075	94,[illegible]

Articles.	1895.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton.....bales..	450	112	$13,[illegible]
Staves.....	10,000	10	[illegible]
Rosin.....barrels..	1,100	198	1,[illegible]
Rice, rough.....bushels..	1,000	22	[illegible]
Cypress timber.....sticks..	10,000	20,000	50,[illegible]
Fertilizers from cotton-seed mills.....sacks..	2,000	200	4,[illegible]
Other produce.....	.....	40	[illegible]
Total.....	.....	20,577	71,[illegible]
INWARD FREIGHTS.			
General merchandise.....	.....	1,120	56,[illegible]
Grand total.....	.....	21,697	127,[illegible]

Commercial statistics—Continued.

Articles.	1896.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton ..... bales..	400	100	$16,000
Linters	400	100	1,200
Cotton-seed oil ..... barrels..	600	142	9,000
Cotton seed	.....	700	14,700
Hay ..... bales..	4,000	200	4,000
Cotton-seed meal	.....	125	3,125
Fertilizers	.....	1,500	37,500
Timber ..... sticks..	15,000	30,000	60,000
Grain ..... bushels..	5,000	125	2,500
Total	.....	32,992	148,025
INWARD FREIGHTS.			
General merchandise	.....	1,510	75,500
Fertilizers	.....	500	10,000
Grand total	.....	35,002	233,525

Articles.	1897.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton ..... bales..	500	100	$15,000
Cotton-seed oil ..... barrels..	550	125	5,000
Cotton seed	.....	800	9,600
Hay ..... bales..	2,000	100	2,000
Cotton-seed meal	.....	200	4,000
Oats ..... bushels..	5,000	115	2,000
Rice, rough ..... do....	5,000	110	5,000
Cotton-seed hulls	.....	20	200
Timber ..... sticks..	20,000	40,000	80,000
Total	.....	41,570	122,800
INWARD FREIGHTS.			
Fertilizers	.....	1,000	20,000
General merchandise	.....	1,200	60,000
Grand total	.....	43,770	202,800

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on Wateree River, South Carolina, for fiscal year ending June 30, 1897:

Snagging and clearing banks where most urgently needed were done at intervals during the year between the mouth of the river and 67 miles above to Camden, the head of navigation. The following obstructions were removed: From the channel, 280 logs, 76 stumps, 329 large snags, 5 cords small snags; from the banks 80 trees and 4 cords of brush were cut. Of the total amount expended, nine-tenths were used on the channel and one-tenth on the banks. The removal of each obstruction cost, approximately, 24 cents.

REMARKS.

New obstructions are continually forming in this stream. It will require at least $6,000 per year to maintain a good navigable channel over this river. The current carries large quantities of drift, which, lodging along the banks, form new obstructions. This stream requires continual care and watchfulness to prevent it becoming impassable. It has plenty of width and depth, there being not less than 4 feet depth at dead low water between its mouth and Camden, for excellent navigable purposes. One of the self-propelling snag boats left Georgetown in April, passed through the Estherville-Minim Creek Canal, and arrived at Camden, a distance of 216 miles from Georgetown by this route, in about three days. The snag boat made several stops along the way to remove obstructions. The boat is about 75 feet long, 20 feet beam, having a draft of 4 feet. No difficulty was experienced in making the trip, and this proves the practicability of inside navigation from the upper Wateree to Georgetown.

RECOMMENDATIONS.

It is respectfully recommended that a good channel be maintained, so that steamers can be run throughout the whole year to Camden.

* * * * * * *

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 9.

IMPROVEMENT OF CONGAREE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1140, Annual Report for 1885. For map of river see page 1194, Annual Report for 1889. For project and estimate for lock movable dam at Granby, see page 1184, Annual Report for 1896.

WORK OF PAST YEAR.

The snag boat was run over the river a few times, and kept it in safe navigable condition.

Appended to this report is a valuable statement of the manufacturing and commercial statistics of Columbia, which is situated at the head waters of the Congaree River.

For details of work done, reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has been in local charge during the year.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year 1896, $0.00.

Money statement.

July 1, 1896, balance unexpended	$3,089.5
June 30, 1897, amount expended during fiscal year	1,411.5
July 1, 1897, balance unexpended	1,678.0
July 1, 1897, outstanding liabilities	193.5
July 1, 1897, balance available	1,484.5
Amount (estimated) required for completion of existing project	23,500.0
Amount that can be profitably expended in fiscal year ending June 30, 1899	20,000.0
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made.

By act of Congress—	
Approved August 5, 1886	$7,5
Of August 11, 1888	7,5
Approved September 19, 1890	5,0
Approved July 13, 1892	5,0
Of August 17, 1894	4,0
Passed June 3, 1896	2,0
Total	31,0

Total expenditures, including June 30, 1897, $29,321.93.

COMMERCIAL STATISTICS.

Articles.	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
otton.....bales..	100	25	$5,000	150	38	$5,250
pirits of turpentine.....barrels.	218	41	4,360	303	30	7,575
osin .....do....	8,200	1,435	11,480	10,975	2,743	16,450
ay .....bales..	.....	.....	.....	.....	.....	.....
otton seed.....tons..	.....	.....	.....	.....	275	2,750
Total	.....	1,501	20,840	.....	3,086	32,025
INWARD FREIGHTS.						
eneral merchandise.....	.....	900	27,000	.....	600	30,000
Grand total	.....	2,401	47,840	.....	3,686	62,025

Articles.	1893.			1894.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
OUTWARD FREIGHTS.						
Cotton.....bales..	225	56	$7,875	.....	.....	.....
Spirits of turpentine.....barrels..	250	50	3,750	200	50	$3,500
Rosin .....do....	6,500	1,300	13,000	1,600	224	1,760
Hay .....bales..	500	75	1,500	.....	.....	.....
Cotton seed.....tons..	500	500	5,000	.....	.....	.....
Timber .....sticks..	.....	.....	.....	3,000	6,000	18,000
Granite.....cubic yards..	.....	.....	.....	1,200	1,500	7,500
Total	.....	1,981	31,125	.....	7,774	30,760
INWARD FREIGHTS.						
General merchandise	.....	800	40,000	.....	200	10,000
Grand total	.....	2,781	71,125	.....	7,974	40,760

Articles.	1895.		
	Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton .....bales..	300	75	$9,000
Cotton seed.....sacks..	8,500	350	3,500
Cotton-seed mea.....do....	350	18	700
Rosin .....barrels..	2,000	350	2,500
Timber... ....sticks..	4,000	8,000	20,000
Total	.....	8,793	35,700
INWARD FREIGHTS.			
General merchandise.....	.....	200	10,000
Grand total.....	.....	8,993	45,700

Commercial statistics—Continued.

Articles.	1896. Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton ..... bales..	500	125	$20,00
Rosin ..... barrels..	2,300	460	5,75
Spirits turpentine	600	150	9,00
Hay ..... bales..	11,300	565	11,30
Grain ..... bushels..	8,500	170	4,25
Lumber ..... feet B. M..	120,000	200	2,40
Staves:			
Oak	135,000	337	2,70
Pine	100,000	100	50
Timber ..... sticks..	7,000	14,000	28,00
Total	.....	16,107	83,90
INWARD FREIGHTS.			
Fertilizers	.....	600	15,00
General merchandise	.....	1,600	80,00
Grand total	.....	18,307	178,90

Articles.	1897. Number.	Tons.	Value.
OUTWARD FREIGHTS.			
Cotton ..... bales..	100	20	$3,000
Rosin ..... barrels..	1,000	200	2,000
Spirits turpentine ..... do....	200	40	3,000
Hay ..... bales..	1,200	60	1,200
Grain ..... bushels..	1,500	37	70
Staves, oak and pine	40,000	100	3,200
Timber ..... sticks..	20,000	40,000	80,000
Total	.....	40,457	93,100
INWARD FREIGHTS.			
General merchandise	.....	300	15,000
Fertilizers	.....	100	2,000
Grand total	.....	40,857	110,100

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1897.

CAPTAIN: I have the honor to report as follows on Congaree River, South Carolina, for fiscal year ending June 30, 1897.

Work was carried on at intervals and such obstructions were removed as most interfered with navigation. This consisted of 60 logs, 39 stumps, 58 large snags removed from the channel and 8 trees cut from the banks.

Of the total amount expended nine and one-half tenths were used on the channel and one-half tenth on the banks. The removal of each obstruction cost approximately 50 cents.

The snag boat intended to work on this stream was most needed during the year on the other rivers, consequently only a small amount of work could be done on the Congaree. Operations will be continued on this stream during the low waters of the next fiscal year, when it is expected that a great deal more good will be accomplished.

REMARKS.

It is still expected that a regular line of steamers will soon be run on this river, when the people at Columbia and along its banks will get the relief that they so badly need in the way of water transportation. While the project proposes to secure a thoroughly cleared channel of 4 feet depth over the navigable length of the river, no effort has yet been made to accomplish that by removing the sand shoals, several in number, which might be done without much difficulty by dredging. Yearly appropriations so far have been entirely inadequate to permit such work. There is

ess than 4 feet, possibly not more than 2 feet depth at these places, during dead ow water. These shoals interfere very greatly with navigation, and should be by ll means removed either by suction or scoop dredging. For the most part the Con-aree is deep enough to accommodate river steamers of large size. It is indeed a isfortune that no regular schedule for the running of boats can be carried out so ong as these shoals exist, preventing the passage of boats at low water. After the mprovement is completed $6,000 at least will be required for its maintenance yearly.

RECOMMENDATIONS.

It is respectfully recommended that a good channel be provided and maintained o a depth of 4 feet and 80 feet wide at low water, so as to permit steamers to run minterruptedly throughout the whole year, from the mouth of the river to at least ranby Landing, but better still to Gervais Street Bridge at the city of Columbia. * * * The Congaree is of very great importance in the commerce of South Caro-ina, and its improvement would be of vast benefit.

* * * * * * *

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 10.

IMPROVEMENT OF HARBOR AT CHARLESTON, INCLUDING SULLIVAN ISLAND AND MOUNT PLEASANT SHORE, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For history of operations up to June 30, 1888, see page 970, Annual Report for 1888. For modified project, including estimates, see page 1150, Annual Report for 1889. For full history of all operations up to and including the completion of the jetties, with full discussion of the project and costs, see page 1189, Annual Report for 1896.

WORK OF PAST YEAR.

The dredge was kept at work during the year, being overhauled and repaired twice, once on account of a break in the bedplate of her main engine, and once for the regular annual calking and sheathing of bins, and fitting of dump gates. Toward the end of the year some stone-work was done at the inner end of the North Jetty to strengthen its shore connection and to preserve the Government reservation from erosion.

SURVEYS.

All depths discussed and shown on the maps are given in feet at mean low water.

Two surveys were made during the year which showed that the deepening of the entrance was continuing in a very satisfactory manner. At the time of the annual survey, June 9, the regular entrance channel on the range of St. Philips Church Light and Sumter Light had a center depth of 19¼ feet, with a width between 18-foot curves of 175 feet. As soon as the extreme outer shoal is passed this range carries vessels through water not less than 22 feet deep at low tide till they reach the very deep water of the main inner harbor. In March, April, and May, the dredge had been able to do only the equivalent of about one month's work on the outer shoal, which shows that the depth of 19 feet is self-maintaining, at any rate for that length of time.

That advantage has been taken of this improvement is shown by the fact that a steamer drawing 22 feet 4 inches crossed the bar in September, 1896; one drawing 21 feet 4 inches in December, 1896, and one drawing 22 feet 3 inches in February, 1897, all without touching bottom. The greatest draft crossing the bar before the jetties were built was 19 feet. This vessel was bumped across the bar on a very high spring tide. Vessels were then loaded to 17 feet as a maximum, and all commerce entered through the southern channels, about 3 miles farther south than the present jetty channel.

The details of the changes in curves and depths are fully discussed in the report of my assistant engineer, Mr. James P. Allen, who has filled the position of principal civil assistant in this district for many years in a most conscientious and satisfactory manner. The salient points to which attention is especially invited are the appearance for the first time of a clear 19-foot channel leading from the deepest part of the jetty channel out past the outer end of the North Jetty. This opening is as yet too narrow, and involves too great a change in direction to be of use as a deep channel of entrance for large vessels, but it has formed without the aid of dredging, and with time will deepen and widen as has been predicted in successive annual reports. A broad and safe 15½-foot channel at low water now exists on a line leading due east from black spar buoy No. 3. The channel out past the outer end of the south jetty is not so deep as last year, but still carries a safe 16½ feet with a width of over 700 feet. A study of the curves and mean soundings shows more conclusively than in previous years the tendency of material on the outer bar to drift off toward the southwest where it is entirely out of the way. The formation of this 19-foot channel to the north of all the outer shoals and in a place where no dredging has been done, indicates clearly that the time is approaching when the necessity for further dredging will cease.

The straight channel on the dredge range through the inner shoal now has a center depth of a foot more than the project calls for, with a width of over 200 feet between the bounding 18-foot curves.

During the year about 500,000 cubic yards of material has disappeared from the area bounded by the 21-foot curves outside of the bar and the outside of the deep water in the main harbor and the axes of the jetties prolonged till they intersect these curves. Of these 500,000 cubic yards of material, about 100,000 cubic yards has been removed by scour, unaided by dredging, from the northern third of this area. From the middle third about 400,000 cubic yards has been removed by scour and dredging combined. In the southern third the cut and fill are about balanced. About 6 per cent of the total scour has come from the outer shoal; somewhat over half of this is attributed to dredging.

COSTS.

During the year more extensive repairs than usual have been put on the dredge, and her outfit was increased by an expensive steam windlass and some other changes in machinery. The advantage of these changes was indicated by her increased output, nearly 50,000 cubic yards of material having been handled during the month of June, with the dredge absent from the dock only about twelve hours a day. During the year she has removed about 386,000 cubic yards, and the total expenditures from this appropriation for all purposes, including the main office, has been less than $40,000. The cost per cubic yard has thus been less than 11 cents.

Stonework on the shore end of the north jetty was done under informal agreement with Messrs. Jacob Friday & Sons for $2.25 per ton in place on the jetty.

No other expense for maintaining the jetties has been incurred, and they remain in first-class condition.

The head of Morris Island has cut considerably during the year, but near the jetty itself there has been a great accretion of sand, mostly below high-water mark. The western half of the shore lines of Sullivan Island was surveyed, and the beach shows erosion, generally slight in extent. This is the first time in years that this beach has not shown accretion when considered as a whole.

This work is in the collection district of Charleston, S. C., which is the port of entry. Amount of duties collected in the calendar year 1896, $19,997.81.

Money statement.

July 1, 1896, balance unexpended		$220,630.22
June 30, 1897, amount expended during fiscal year		39,993.52
July 1, 1897, balance unexpended		180,636.70
July 1, 1897, outstanding liabilities	$6,560.00	
July 1, 1897, amount covered by uncompleted contracts	4,240.00	
		10,800.00
July 1, 1897, balance available		169,836.70

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 18, 1878	$200,000	Approved Sept. 19, 1890	$370,000
Approved March 3, 1879	200,000	Approved July 13, 1892	225,000
Approved June 14, 1880	170,000	Approved March 3, 1893	750,000
Approved March 3, 1881	175,000	Approved August 18, 1894	450,000
Passed August 2, 1882	300,000	Approved March 2, 1895	500,000
Approved July 5, 1884	250,000		
Approved August 5, 1886	187,500	Total	4,127,500
Of August 11, 1888	350,000		

Total expenditures to June 30, 1897, $3,946,863.30.

Abstract of proposals for furnishing 1,600 tons of steam coal received in response to advertisement of December 24, 1896, and opened January 23, 1897, by Capt. Frederic V. Abbot, Corps of Engineers.

Name of bidder.	Coal to be furnished.	Price per ton.
Interstate Coal and Coke Co	Georges Creek (informal)	$2.91
Merchants' Coal Co	Big Vein, Cumberland	2.85
Broderick & Ferguson	Big Vein, Elk Garden	2.65
Consumers' Coal Co	New River	2.70
B. Wallis & Co	Georges Creek, Big Vein	3.00
E. P. Townsend	Georges Creek, Cumberland, or Webster	3.40
Wm. Johnson & Co	Pocahontas	3.19
Frederick F. Leyden		2.73

Contract in force.

Contract for—	Name of contractor.	Date of approval.	Date of beginning.	Date of completion.
Furnishing 1,600 tons of steam coal.	Broderick & Ferguson	Feb. 25, 1897	Apr. 1, 1897	Apr. 1, 1898

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Charleston, S. C., from January 1, 1875, to December 31, 1895.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1875	604	382,018	11,849	38	13,144	526	198	88,879	2,404	740	484,041	14,779
1876	471	340,438	10,113	44	11,898	375	224	101,272	2,768	739	453,609	13,256
1877	400	324,919	9,885	32	13,972	308	336	105,480	2,851	668	444,371	13,044
1878	396	322,527	9,629	44	19,925	455	329	163,368	3,967	772	505,830	14,045
1879	383	326,661	10,027	39	12,505	319	249	121,503	3,292	668	460,669	13,638
1880	441	388,026	20,641	38	12,412	327	191	110,771	2,595	670	511,209	13,563
1881	413	399,732	10,977	34	9,430	272	257	121,077	3,073	703	530,239	13,723
1882	410	384,690	9,446	35	4,807	224	200	105,647	2,648	645	495,144	12,318
1883	345	277,538	7,629	26	3,002	157	239	113,708	2,958	610	394,306	10,744
1884	425	304,382	8,822	21	3,910	145	214	134,076	3,269	660	442,368	12,236
1885	375	268,477	9,687	15	2,244	97	187	106,233	2,586	577	377,054	12,320
1886	901	550,209	.....	20	3,714	131	182	114,507	2,646	1,103	668,403	.....
1887	927	656,949	.....	30	7,074	198	127	67,257	1,607	1,084	731,280	.....
1888	a 934	601,771	.....	34	7,750	252	127	72,921	1,779	1,095	682,442	.....
1889	b 839	481,718	9,708	30	6,985	216	136	87,101	1,979	496	575,804	11,603
1890	c 410	600,776	15,577	35	7,205	242	120	81,518	1,828	565	689,499	15,745
1891	d 417	690,776	15,895	27	4,665	179	150	119,199	2,881	594	804,640	18,257
1892	e 388	625,880	14,705	28	5,138	198	87	69,091	1,416	503	700,109	16,314
1893	f 336	566,923	13,106	28	6,622	202	108	92,532	1,970	474	666,077	15,278
1894	g 327	574,423	13,155	22	4,765	137	100	100,213	1,856	449	679,401	15,148
1895	h 369	625,121	14,328	21	5,569	197	57	51,686	999	447	682,356	15,524
1896	i 382	568,438	14,251	22	7,068	170	74	75,564	1,390	428	666,060	15,811

a Of these, 32 vessels (t 5), with crews numbering 606, were foreign.
b Of these, 29 vessels (t), with crews numbering 546, were foreign.
c Of these, 58 vessels (t 3), with crews numbering 1,110, were foreign.
d Of these, 34 vessels (t 3), with crews numbering 717, were foreign.
e Of these, 31 vessels (t 0), with crews numbering 562, were foreign.
f Of these, 31 vessels (t 8), with crews numbering 633, were foreign.
g Of these, 9 vessels (to), with crews numbering 213, were foreign.
h Of these, 22 vessels (t 6), with crews numbering 487, were foreign.
i Of these, 15 vessels (t 0), with crews numbering 336, were foreign.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1875	461	328,266	10,830	57	24,679	555	211	94,595	2,537	729	447,540	13,922
1876	491	278,744	9,095	60	23,598	546	230	103,276	2,812	721	405,618	12,453
1877	335	234,429	7,719	35	22,767	423	250	106,446	2,910	620	365,662	11,052
1878	266	172,988	5,801	45	24,397	479	398	149,975	3,591	809	347,360	14,045
1879	287	188,212	6,268	34	11,282	292	278	149,052	3,643	599	348,546	10,203
1880	290	190,733	6,348	45	23,210	481	246	155,768	3,375	587	369,711	10,204
1881	268	167,569	5,942	32	9,239	255	278	153,796	3,464	578	350,604	9,661
1882	147	113,699	3,690	40	7,375	273	263	158,250	3,584	450	279,324	7,566
1883	98	48,714	2,018	27	4,560	181	299	154,653	3,816	424	207,927	6,014
1884	212	116,020	4,555	31	7,845	217	276	161,588	3,727	519	285,453	8,488
1885	191	99,658	5,047	24	5,217	164	204	119,602	2,836	419	224,467	8,047
1886	890	549,259	.....	25	5,469	165	201	126,943	2,875	1,116	675,671	.....
1887	889	610,646	.....	28	5,837	189	173	115,218	2,548	1,089	731,701	.....
1888	a 911	580,468	.....	30	5,848	211	144	96,146	2,105	1,085	682,462	.....
1889	b 46	85d. 596	778	25	5,080	174	155	112,037	2,495	226	155,713	3,467
1890	c 21	12,862	292	41	10,181	318	166	126,079	2,676	228	149,102	3,286
1891	d 39	21,197	436	32	6,887	216	164	143,398	2,809	255	171,482	3,461
1892	e 26	29,752	566	28	5,760	197	111	89,390	1,798	165	124,902	2,569
1893	f 49	47,756	978	29	5,761	198	100	88,421	1,671	178	141,938	2,847
1894	g 45	36,760	723	22	5,422	152	90	97,769	1,715	158	139,951	2,590
1895	h 84	88,420	1,915	13	2,283	96	72	81,420	1,831	169	170,123	3,342
1896	i 69	90,106	1,882	8	1,487	51	67	74,216	1,843	144	165,809	3,776

a Of these, 7 vessels (tonnage, 4,295), with crews numbering 62, were foreign.
b Of these, 4 vessels (tonnage, 2,960), with crews numbering 47, were foreign.
c Of these, 7 vessels (tonnage, 6,186), with crews numbering 135, were foreign.
d Of these, 18 vessels (tonnage, 16,332), with crews numbering 303, were foreign.
e Of these, 13 vessels (tonnage, 15,068), with crews numbering 251, were foreign.
f Of these, 29 vessels (tonnage, 31,810), with crews numbering 554, were foreign.
g Of these, 19 vessels (tonnage, 15,795), with crews numbering 292, were foreign.
h Of these, 11 vessels (tonnage, 10,325), with crews numbering 222, were foreign.
i Of these, 18 vessels (tonnage, 22,047), with crews numbering 363, were foreign.

Arrivals and clearances of vessels and commerce at Charleston, S. C., etc.—Continued.

COMMERCE.

Year.	Value of exports.	Value of imports.	Duties collected.	Year.	Value of exports.	Value of imports.	Duties collected.
1875	$19,655,966	$680,843	$80,656.00	1886	$17,410,000	$685,000	$24,876.00
1876	18,088,152	455,562	89,168.00	1887	15,288,316	484,063	30,817.00
1877	16,917,492	161,237	46,848.00	1888	13,006,578	625,770	76,398.00
1878	21,167,575	184,127	36,990.00	1889	16,080,255	664,696	16,728.82
1879	18,093,126	127,981	24,070.00	1890	15,204,771	836,626	18,356.81
1880	24,939,259	248,158	46,453.98	1891	21,906,076	1,204,588	24,308.47
1881	21,927,269	723,049	99,066.23	1892	11,460,681	368,926	15,494.24
1882	19,907,099	459,970	45,263.33	1893	11,056,287	883,842	16,689.75
1883	20,144,365	467,048	48,760.69	1894	10,877,048	683,324	28,423.01
1884	20,833,424	503,504	36,624.76	1895	10,063,605	522,721	31,370.26
1885	15,157,889	588,191	32,741.68	1896	11,144,669	641,177	19,997.81

G. D. BRYAN, *Collector.*

LETTER OF MR. GEORGE D. BRYAN, COLLECTOR OF CUSTOMS.

OFFICE OF THE COLLECTOR OF CUSTOMS,
Port of Charleston, S. C., April 29, 1897.

SIR: In reply to your request contained in your letter of the 24th of April, 1897, I have the honor to inclose you the statistical report you desire from this office.

I beg to call your attention to the fact that our records do not show all of the coastwise business done at this port, as vessels trading coastwise within the limits of a great collection district are not required by law to either enter or clear at the custom house, and hence the great bulk of the tonnage trading between this port and those ports to the north does not appear on our records.

Respectfully, yours,

GEO. D. BRYAN, *Collector.*

Capt. F. V. ABBOT,
United States Engineers.

Import and export trade of Charleston, S. C., from January 1 to December 31, 1894.

Articles.	Number.	Tons.	Value.
IMPORTS.			
Bacon.....pounds..	41,000,000	20,000	$2,460,000
Flour.....barrels..	340,000	26,000	1,300,000
Corn.....bushels..	1,300,000	32,500	650,000
Hay.....bales..	70,000	7,000	140,000
Oats.....bushels..	255,000	4,080	105,000
Grits and meal.....barrels..	185,000	12,800	555,000
Sugar.....do....	125,000	17,500	1,500,000
Molasses.....do....	10,000	1,250	75,000
Salt.....sacks..	50,000	5,000	87,500
Sea-island cotton bagging.....yards..	20,000	50	7,500
Cotton bagging and burlaps.....do....	4,000,000	10,500	430,000
Jute butts and 1,250,000 yards bagging.....bales..	22,556	1,900	265,000
Petroleum and other oils.....	12,500	2,000	185,000
Ice.....	.....	6,000	30,000
Cigars.....	8,000,000	1,800	700,000
Tobacco.....pounds..	1,450,000		
Paper and stationery.....	.....	2,000	420,000
Groceries and dry goods.....	.....	125,000	17,500,000
Hardware.....	.....	75,000	1,750,000
Boots and shoes.....	.....	12,000	850,000
Crockery.....	.....	7,500	320,000
Drugs and medicines.....	.....	2,800	800,000
Stone, granite, rubble, marble, brownstone, curbing, and paving stone.....	.....	205,000	500,000
Kainit.....	.....	20,000	150,000
Sulphur and brimstone.....	.....	23,700	183,000
Nitrate of soda and manure salt.....	.....	1,000	27,600
Muriate of potash.....	.....	4,800	158,000
Pyrites.....	.....	13,000	39,000
Lime, cement, brick.....	.....	15,000	40,000
Manufactures.....	.....	60,000	15,000,000
Fertilizers.....	.....	515	5,150
Total.....	.....	715,195	46,132,750

Import and export trade of Charleston, S. C., etc.—Continued.

Articles.	Number.	Tons.	Value.
EXPORTS.			
Upland cotton ..... bales..	405,750	100,000	15,000,000
Sea-island cotton ..... bags..	3,600	500	225,000
Rice ..... casks..	36,000	7,000	450,000
Rosin ..... barrels..	80,000	16,000	130,000
Turpentine ..... casks..	15,500	3,000	220,000
Phosphate-rock	.....	325,000	1,250,000
Fertilizers ..... sacks..	316,000	31,600	4,500,000
Lumber, timber, and cross-ties ..... feet..	73,000,000	1,500,000	735,000
Cotton goods ..... bales..	75,000	16,500	3,750,000
Cotton-seed meal cake	.....	5,100	76,500
Kaolin ..... casks..	8,000	7,500	85,000
Vegetables and fruits ..... crates.	350,000	750	2,500,000
Strawberries ..... quarts..	260,000	375	60,000
Melons ..... carloads..	1,000	20,000	220,000
Miscellaneous	.....	50,000	150,000
Total	.....	2,083,325	29,341,500

Export and import trade of Charleston from January 1 to December 31, 1895.

Articles.	Number.	Tons.	Value.
EXPORTS.			
Upland cotton ..... bales..	316,384	72,000	$11,500,000
Sea-island cotton ..... bags..	9,025	1,400	710,000
Rice ..... casks..	70,000	10,000	800,000
Rosin ..... barrels..	75,000	15,000	175,000
Turpentine ..... do....	12,000	2,410	200,000
Phosphate rock, crude and ground ..... do....	360,000	360,000	1,420,000
Fertilizers ..... do....	160,000	160,000	2,400,000
Lumber ..... feet..	90,000,000	1,600,000	660,000
Cotton goods ..... bales..	90,000	18,000	4,000,000
Cotton-seed meal and cake ..... tons..	7,000	7,000	140,000
Kaolin ..... do....	15,000	15,000	125,000
Vegetables and fruit ..... crates..	400,000	20,000	2,000,000
Strawberries ..... quarts..	375,000	75	75,000
Melons ..... carloads..	850	17,750	210,000
Oysters, clams, and fish ..... packages..	10,000	150	125,000
Miscellaneous	.....	60,000	155,000
Total	.....	2,358,785	24,695,000
IMPORTS.			
Bacon ..... pounds..	13,000,000	7,000	800,000
Flour ..... barrels..	350,000	35,000	1,450,000
Corn ..... bushels..	1,500,000	46,000	750,000
Hay ..... bales..	75,000	7,500	150,000
Oats ..... bushels..	200,000	8,600	120,000
Grits and meal ..... barrels..	175,000	4,000	500,000
Sugar ..... do....	138,500	21,000	1,400,000
Molasses ..... do....	12,700	1,950	185,000
Salt ..... sacks..	50,000	5,000	35,000
Sea-island cotton bagging ..... yards..	60,000	80	12,000
Cotton bagging and burlaps ..... do....	5,200,000	8,000	450,000
Jute butts ..... bales..	20,030	1,958	130,000
Petroleum and other oils ..... barrels..	14,000	2,500	140,000
Ice, imported and made ..... tons..	10,000	10,000	45,000
Cigars ..... number..	7,000,000	2,000	720,000
Tobacco ..... pounds..	1,500,000		
Paper and stationery ..... tons..	2,250	2,250	430,000
Groceries and dry goods ..... do....	150,000	150,000	20,000,000
Hardware ..... do....	78,000	78,000	1,500,000
Boots and shoes ..... do....	15,000	15,000	1,500,000
Crockery ..... do....	7,500	7,500	300,000
Drugs and medicines ..... do....	3,000	3,000	750,000
Granite, marble, brownstone, curbing, and paving stone .... do....	180,000	180,000	480,000
Kainit ..... do....	22,128	22,128	126,572
Sulphur and brimstone ..... do....	21,846	21,846	181,499
Nitrate of soda and manure salt ..... do....	3,141	3,141	106,514
Muriate of potash ..... do....	4,098	4,098	153,000
Pyrites ..... do....	6,562	6,563	17,438
Lime, cement, and brick ..... do....	12,000	12,000	120,000
Manufactures	.....	.....	13,000,000
Total	.....	661,113	45,552,003

Export and import trade of Charleston, S. C., from January 1 to December 31, 1896.

IMPORTS.

Articles.	Number.	Tons.	Value.
Bacon ..... pounds..	26,000,000	13,000	$1,660,000
Flour ..... barrels..	375,000	37,500	1,675,000
Corn ..... bushels..	1,350,000	41,000	800,000
Hay ..... bales..	65,000	6,500	135,750
Oats ..... bushels..	260,000	5,700	131,000
Grist and meal ..... sacks..	180,000	7,500	185,000
Sugar ..... barrels..	155,100	23,265	1,750,000
Molasses ..... do....	14,000	2,450	200,000
Salt ..... sacks..	48,000	4,890	25,000
Sea-island cotton bagging ..... yards..	51,000	80	12,300
Cotton bagging and burlaps ..... do....	7,500,000	9,000	630,000
Jute butts ..... bales..	17,539	1,800	102,000
Petroleum and other oils ..... barrels..	16,000	8,000	160,000
Ice ..... tons..	20,000	20,000	70,000
Cigars ..... number..	6,000,000	.....	.....
Tobacco ..... pounds..	1,350,000	2,500	695,000
Paper and stationery ..... tons..	3,600	3,600	400,000
Groceries and dry goods ..... do....	150,000	150,000	20,500,000
Hardware ..... do....	75,000	75,000	1,450,000
Boots and shoes ..... do....	16,000	16,000	1,550,000
Crockery ..... do....	8,000	8,000	350,000
Drugs and medicines ..... do....	3,000	3,000	600,000
Stone, granite, marble, rubble, brownstone, curbing, paving....	200,000	200,000	450,000
Kainit	21,563	21,563	139,696
Sulphur and brimstone	8,000	8,000	96,500
Nitrate soda, manure salt	800	800	24,400
Muriate potash	2,527	2,527	98,000
Pyrites	12,272	12,272	28,100
Lime, cement, bricks	13,500	13,500	125,000
Manufactures	.....	.....	13,500,000
Fertilizers	80	80	800
Coffee ..... sacks..	15,000	1,000	300,000
Total	.....	693,527	47,838,546

EXPORTS.

Upland cotton ..... bales..	894,516	98,000	13,808,060
Sea-island cotton ..... bags..	10,000	1,655	550,000
Rice ..... casks..	90,000	30,000	2,500,000
Rosin ..... barrels..	78,000	15,330	193,000
Turpentine ..... do....	12,000	2,500	245,500
Phosphate rock ..... tons..	345,000	345,000	1,275,100
Fertilizers ..... do....	260,000	260,000	4,183,200
Lumber, timber, and cross-ties ..... feet..	86,000,000	1,700,000	860,000
Cotton goods ..... bales..	85,000	17,580	4,555,510
Cotton-seed meal cake ..... tons..	7,500	7,500	150,000
Kaolin ..... casks..	26,500	26,000	265,100
Vegetables and fruit ..... crates..	950,000	45,000	2,150,000
Strawberries ..... quarts..	1,110,000	155	116,000
Melons ..... car loads..	600	15,000	175,000
Oysters, clams, and fish ..... packages..	10,000	250	100,000
Miscellaneous ..... tons..	60,000	60,000	300,000
Total	.....	2,623,970	31,486,470
		693,527	47,838,546
Grand total	.....	3,317,497	79,325,016

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1897.

CAPTAIN: I have the honor to submit the following report for Charleston Harbor, South Carolina:

Stonework, north jetty.—The erosion of the beach of Sullivan Island west of the shore end of the north jetty having become serious, as reported last year, it was decided by you to raise the inner end of this jetty with the object of checking this action. Work began on this under informal agreement with Jacob Friday & Sons on June 7, 1897, at a point about 700 feet from the shore end. The stone is to be from 1 ton to 7 tons in weight from about high-water line out to 700 feet from the shore end. The jetty will also be extended inward about 160 feet with stone weigh-

Import -

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ing from 50 to 500 pounds. This last will be distributed 20 feet wide and 3 feet high. Prior to July 1, 1897, 2,316 tons of large stone had been placed on the outer portion near 700 feet from the shore end. About 330 tons of the small stone has been piled at low water, but as this is not in its final position it will not be paid for until placed above high-water mark.

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Dredging.—The *Charleston* continued work until December 17, 1896, at which time she was laid up for repairs. A new bedplate was put in under the propelling engine to replace the old one, which was cracked. A new steam windlass was put on her, and she was supplied with larger anchors, as those previously used were too small for stormy weather. She resumed work on January 18, 1897, and continued dredging until April. On the 11th of this month she sailed for Newport News, Va., for general and extensive repairs, and returning resumed dredging between the jetties on May 12, 1897. She has removed and dumped 153,437 cubic yards from the outer shoal and 232,445 cubic yards from the inner shoal, making a total of 385,882 cubic yards removed and dumped.

Surveys.—The area between the jetties and seaward of their ends was surveyed in February, and again for the Annual Report in April, May, and June. The area covered by the annual survey is less extensive than last year, but it has been more closely sounded.

Tide gauges.—The tide gauge at Fort Sumter has been kept running under the supervision of Mr. Thomas Britt, light keeper, but the others were not run continuously. The outer gauge has been disconnected, the clock being kept running; so that when surveys are to be made the apparatus can be easily started. This gauge was used in reducing soundings for both surveys.

Mean soundings.—To render accurate the method of comparison by mean soundings one of two conditions should be observed. The squares should be small enough to give all of the soundings in them of nearly the same depth, or there should be about the same distribution of the soundings on the maps for successive years. As the lines of soundings platted this year are generally closer than last year, it has been considered best in calculating the mean to use those lines corresponding as nearly as possible with last year's survey. Using the same system of squares as heretofore, we find that on zone No. 1 the six inner squares show a scour of 16,015 cubic yards; the next five along the north jetty show a scour of 89,684 cubic yards; the outer five show a scour of 12,812 cubic yards, and one square beyond shows 19,218 cubic yards fill. The total scour in this zone is 99,293 cubic yards. On zone No. 2 the inner six squares show 73,669 cubic yards scour; the middle five 92,887 cubic yards scour; the outer five 281,864 cubic yards scour, and the extreme outer two squares 22,421 cubic yards fill. The total scour on this zone is 425,999 cubic yards. On zone No. 3 the inner six squares show 67,263 cubic yards fill; the middle five 3,203 cubic yards scour; the outer five 57,654 cubic yards scour, and the extreme outer two 22,421 cubic yards fill. The total fill on this zone is 28,827 cubic yards. The total scour over the whole area considered is 496,465 cubic yards.

Taking the outer six on zone No. 1, and the outer seven on zones Nos. 2 and 3, there is an excess of scour over fill of 288,270 cubic yards. In the middle block of fifteen squares there is a scour of 182,571 cubic yards. On the inner eighteen squares there is a scour of 25,624 cubic yards. When the amount of material taken out by the dredge is considered, a slight shoaling on the inner portion is probable. Nearly 60 per cent of the scour is over the area which includes the outer shoal, somewhat over half of which may be attributed to dredging.

Curves and depths in jetty channel.—A navigable channel, not less than 19 feet deep at mean low water is indicated by the soundings. The width between the 18-foot curves at the narrowest point on the bar is about 175 feet. The only break in the 21-foot curve is on the outer bar for about 800 feet, measured on the line of deepest water. Measured along the center line of the dredge cut, a distance of about 1,500 feet between the inner and outer 21-foot curves is shown. There is, however, a shoal of less than 21 feet at low water on the continuation of this range seaward, which can be avoided by turning to the northeast after leaving the outer end of the dredge cut. This shoal has been in existence since the initiation of the work. The soundings shown on the chart at the critical point of the channel were taken on June 9, after a long spell of weather so rough that the dredge could not work there. She had, moreover, been absent at Newport News for repairs, so that for the months of March, April, and May, but little material had been removed from this outer shoal. Since June 9 the weather has been good, and she has worked at this place for a large part of her working time, removing in June 32,046 cubic yards from this outer shoal. A few soundings taken June 26 indicate a decided increase of depth in a narrow trench along the center line.

The maximum outward movement of the 18-foot curve opposite the opening between the jetties is about 500 feet, being practically the same on both sides of the cut. The outer curves have also moved outward. North of the north jetty the curves show practically no change. South of the prolongation of the south jetty there is a decided movement to the southward. On the outer shoal the area less

than 12 feet is about the same as last year, but is now shown as one large shoal and one small lump, whereas last year it was broken up into nine lumps. The shoalest sounding is 9.3 feet, compared with 10.2 last year. On the outer shoal and north of the dredge cut the area less than 15 feet was about 56 acres in 1896 and 45½ acres in 1897. The area less than 18 feet was 90 acres in 1896 and 84 acres in 1897. South of the cut the 15-foot shoal was 2½ acres in 1896 and 7½ acres in 1897, and the 18-foot shoal north of the prolongation of the south jetty was 18½ acres in 1896 and 20½ acres in 1897.

The channel pointing about northeast and passing out near the outer end of the north jetty has increased in width and depth. Near the north jetty a passage of not less than 19 feet is shown. This is too squarely across the direction of the tidal currents, and too near the end of the north jetty to be safely navigable. About 15½ feet can be taken out on a line due east from black spar No. 3. The channel pointing a little east of south and crossing the prolongation of the south jetty is not so deep as last year. The maximum depths in the dredge cut have markedly increased, mainly on account of continued dredging.

The curves in the area between the jetties from about 5,000 feet inside of their outer ends inward are but little changed. Those in the area inclosed by the outer portions of the jetties indicate the scour shown by mean soundings.

Condition of the jetties.—The highest parts of both jetties were sketched as in former years, and a profile prepared for each jetty. These have been compared with the profiles for 1896. The north jetty shows no change, except where the work of bringing up the shore end has been begun and at the outer end. A pile of stone has been placed at 700 feet from the shore end, and this will be extended inward. The outer end of the jetty has been somewhat lowered by the waves. The outer end of the south jetty is slightly lower, as is also that portion extending from 7,000 feet to 11,000 feet from the shore end. The rest of the jetty is unchanged.

Sullivan Island.—The high-water line for nearly the whole length of the part surveyed has moved shoreward, the maximum being about 110 feet at a point 1,900 feet west of the north jetty. At 500 feet east of the north jetty it has moved inward 100 feet. A little east of the Bowman Jetty there is no change for several hundred feet. The low-water line is about the same as in 1896, except in a few places where it has moved seaward. There is an exception to this just east of the north jetty, where the low-water line has moved shoreward about 50 feet. The beach between high and low water shows much wider this year than last. The encroachment of the sea was so serious opposite the life-saving station that it was deemed necessary to move the buildings back.

Morris Island.—South of the jetty the high-water line has moved shoreward about 40 feet and the low-water line has moved seaward about 60 feet. The slope of the beach is thus much flatter. North of the jetty both high-water and low-water lines have made out near the jetty, the latter to a marked extent, but near the head of the island they have both moved very markedly shoreward. The maximum change in the high-water line near the head is about 250 feet. This line at the extreme head or northern portion of the island is about 150 feet south of the corresponding point on last year's map.

Mount Pleasant shore.—The jetties built in 1884 are in fair condition. The eastern jetty is being used by a colored man named Prince Goodwin in connection with a row-boat ferry. This ferry gets its business largely in the transportation of laborers from Mount Pleasant, where they live, to Sullivan Island, where they work on the construction of the batteries. That portion of the breakwater of 1892 which was not destroyed by the hurricane of 1893 is in a fair state of preservation.

Vessels crossing the bar with the greatest draft during the year were the following: *Lovstakken*, September 17, 1896, 22 feet 4 inches; *Humbert*, December 28, 1896, 21 feet 4 inches; *Bede*, February 3, 1897, 22 feet 3 inches.

Very respectfully, your obedient servant,

JAMES P. ALLEN, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 11.

IMPROVEMENT OF WAPPOO CUT, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For original project see page 1073, Annual Report for 1881. For modified project see page 1196, Annual Report for 1889. For map of Wappoo Cut see page 1476, Annual Report for 1891.

WORK OF PAST YEAR.

The close of the dredging work in the cove back of Sullivan Island done by the Morris & Cumings Dredging Company left their dredge here idle. They made an offer which, in view of the fact that a tendency to shoal at the mouth of Elliott Cut indicated that some work in the near future would be needed there, was considered so advantageous to the United States as to warrant the recommendation of its acceptance. The bid was 12 cents per cubic yard, the last price under regular formal contract having been 20 cents per cubic yard. They did some work near the Stono River end of Elliott Cut.

A recent examination shows that this work has held well, but in one place elsewhere, to the east of Elliott Cut, there is a depth of only 5 feet.

The deterioration of some of the revetment in Elliott Cut makes it necessary to deposit a small amount of additional stone. An informal agreement has been made with Jacob Friday & Sons to supply and deposit the necessary stone for $2.25 per ton of 2,000 pounds in place.

For details of work done during the past year reference is made to the appended report of my assistant engineer, Mr. James P. Allen, who has been in local charge.

This work is in the collection district of Charleston, S. C., which is its port of entry. Amount of duties collected in the calendar year of 1896, $19,997.81.

Money statement.

July 1, 1896, balance unexpended	$3,999.29
June 30, 1897, amount expended during fiscal year	1,628.76
July 1, 1897, balance unexpended	2,370.53
Amount (estimated) required for completion of existing project	25,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	25,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881	$10,000	Approved July 13, 1892	$10,000
Passed August 2, 1882	10,000	Of August 17, 1894	7,000
Approved July 5, 1884	3,000	Passed June 3, 1896	2,500
Approved August 5, 1886	5,000	Total	62,500
Of August 11, 1888	5,000		
Approved September 19, 1890	10,000		

Total expenditures, including June 30, 1897, $60,129.47.

COMMERCIAL STATISTICS.

Articles.	1888.		1889.	
	Quantity.	Value.	Quantity.	Value.
Phosphate rock.....tons..	60,000	$300,000	70,000	$475,000
Sea-island cotton.....bags..	6,000	360,000	10,000	750,000
Rice.....bushels..	150,000	150,000	250,000	262,500
Vegetables.....crates..	120,000	240,000	80,000	125,000
Fertilizers.....tons..	2,000	30,000	2,500	40,000
Lumber.....feet..	20,000,000	160,000	22,500,000	190,000
Shingles, cross-ties, and other articles.....	.....	.....	.....	25,000
Total.....	.....	1,240,000	.....	1,867,500

Commercial statistics—Continued.

Articles.	1891.		1892.	
	Quantity.	Value.	Quantity.	Value.
Phosphate rock.....tons..	75,000	$525,000	65,000	$300,000
Sea-island cotton.....bags..	12,000	800,000	10,000	850,000
Rice.....bushels..	240,000	250,000	400,000	300,000
Vegetables.....crates..	90,000	160,000	95,000	200,000
Fertilizers.....tons..	1,400	21,000	3,000	37,500
Lumber.....feet..	25,000,000	200,000	30,000,000	275,000
Shingles, cross ties, and other articles.....	.....	20,000	50,000	35,000
Total	.....	1,976,000	.....	1,997,500

Commercial statistics from January 1 to December 31, 1893.

Articles.	Number.	Tons.	Value.
Phosphate rock.....	.....	78,500	$395,500
Sea-island cotton.....bags..	5,000	.....	450,000
Rice.....bushels..	360,000	.....	350,000
Vegetables.....crates..	120,000	.....	260,000
Fertilizers	.....	4,300	70,000
Lumber .....feet..	35,000,000	.....	290,000
Shingles and other articles.....	.....	60,000	50,000
Total.....	.....	142,800	1,965,500

Commercial statistics, Wappoo Cut, South Carolina, 1895.

Articles.	Number.	Tons.	Value.
Phosphate rock.....	.....	75,000	$325,000
Sea-island cotton.....bags..	3,600	600	225,000
Rice.....bushels..	425,000	18,750	425,000
Vegetables.....crates..	125,000	6,000	250,000
Fertilizers	3,000	3,000	58,000
Timber, lumber, wood.....feet..	40,000,000	80,000	340,000
Shingles, cross-ties, and other articles.....	.....	55,000	60,000
Total.....	.....	238,350	1,683,000

Summary of business from January 1 to December 31, 1895.

Articles.	Number.	Tons.	Value.
Phosphate rock .....tons..	.....	80,000	$300,000
Sea-island cotton .....bags..	6,200	950	420,000
Rice .....barrels..	70,000	10,000	800,000
Vegetables.....crates..	136,000	780	265,000
Fertilizers	.....	3,500	60,100
Lumber .....feet..	50,000,000	95,000	350,000
Shingles and miscellaneous articles.....tons..	.....	60,000	65,000
Total.....	.....	250,230	2,260,100

Commercial statistics, January 1 to December 31, 1896.

Articles.	Number.	Tons.	Value.
Phosphate rock.....	.....	85,000	$325,000
Sea-island cotton.....bags..	7,000	1,000	460,000
Rice .....barrels..	68,000	9,800	780,000
Vegetables.....crates..	185,000	1,200	325,000
Fertilizers	.....	7,000	75,000
Lumber.....feet..	55,000,000	98,000	375,000
Shingles and other miscellaneous articles.....	.....	70,000	70,000
Total.....	.....	272,000	2,410,000

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1897.

CAPTAIN: I have the honor to submit the following annual report for Wappoo Cut, South Carolina:

In September, 1896, an arrangement was made with the Morris & Cumings Dredging Company to do some dredging in Elliott Cut. They began work on September 28 and worked until October 13, at which time they had removed 11,909 cubic yards of sand, mud, and clay. Two cuts were made across Stono Bar, extending from deep water in this river about 400 feet into Elliott Cut. The depth to which these cuts were dredged was about 12 feet at low water. The northern cut was continued inward 700 feet farther than the other, and this inward extension was dredged to a depth of 7 feet at low water. All material was dumped in Stono River from one-fourth to one-half mile below the mouth of Elliott Cut and near the east bank of the river. The price paid for this work was 12 cents a yard.

The revetment of the banks of Elliott Cut has lost its original height in places, due mainly to the scattering of the stone which was piled at the foot of the banks. To bring up such places, and also to supply stone wherever needed, an arrangement has been made by you with Jacob Friday & Sons, the contractors for the 10-inch battery on Sullivan Island. They are to supply suitable stone and do the necessary work for $2.25 per ton for stone in place. On the 30th of June, 1897, nothing had been done.

The transportation business through the cut is of a somewhat irregular character. Only one of the four steamboats now running through it has been doing a regular business for a long period. The other three are small, but at present run with considerable regularity. Four tugs are now towing through Wappoo Cut. There are, as has been from time to time noted, a large number of small sailing vessels using this route, and as it is a part of the inland route from Charleston to the South, occasional pleasure craft and non-seagoing vessels pass through it. The dredging was inspected by Mr. J. B. De Saussure.

An examination of the improved portion of the cut made June 21, 1897, indicates one place where there is only about 5 feet at low water. It is at the west end of the cut of 1891, and east of Elliott Cut. There is at least 6 feet in depth through Elliott Cut. Across the Stono Bar the depth secured by recent dredging is well maintained. There is a channel at least 7 feet deep across the Ashley River Bar.

Respectfully submitted.

JAMES P. ALLEN, *Assistant Engineer.*

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 12.

IMPROVEMENT OF BEAUFORT RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1235, Annual Report for 1890. For reason for increasing estimate see page 1529, Annual Report for 1893.

During the year a reasonable bid having been received for rock dredging, authority was asked and obtained to expend the balance of the funds available under informal agreement.

As much rock was dredged as it was thought safe to remove with the large dredge, which left a dangerous ridge at the edge of the cut. Enough of the reserved funds were expended for the hire of a small dredge and its crew to remove the dangerous ridge of loose stone that the large dredge left along the edge of its cut.

For details of work done reference is made to the appended report of my assistant engineer, Mr. James P. Allen, who has been in local charge.

This river is tributary to the collection district of Beaufort, S. C. Beaufort is the port of entry. Amount of duties collected in the calendar year of 1896, $1,490.40.

Money statement.

July 1, 1896, balance unexpended	$5,705.80
June 30, 1897, amount expended during fiscal year	5,134.16
July 1, 1897, balance unexpended	571.64
Amount (estimated) required for completion of existing project	9,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	9,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—	
Approved September 19, 1890	$12,500
Approved July 13, 1892	12,500
Of August 17, 1894	5,000
Passed June 3, 1896	1,000
Total	31,000

Total expenditures to and including June 30, 1897, $30,428.36.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Beaufort, S. C., from January 1, 1888, to December 31, 1895.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1888	103	121,207	2,630	3	1,093	26	30	21,785	422	136	144,085	3,078
1889	96	128,834	2,728	2	1,461	19	58	54,464	1,096	158	230,193	3,853
1890	43	49,178	927	7	2,987	75	52	48,656	972	102	100,816	1,974
1891	37	40,145	786	3	1,567	26	22	21,503	416	62	63,215	1,222
1892	29	34,979	607	1	896	9	37	43,526	771	67	79,401	1,387
1893	40	51,967	854	4	3,101	38	36	45,774	771	80	100,842	1,663
1894	29	39,171	681	3	2,925	32	41	72,469	1,220	73	114,565	1,993
1895	35	47,397	823	1	1,005	12	30	51,912	1,095	66	100,314	2,039
1896	18	26,978	467	2	1,716	22	33	54,780	968	53	83,474	1,457

CLEARED.

1888	57	68,287	1,566	3	1,465	33	78	85,523	1,561	138	150,275	3,160
1889	57	73,744	1,872	.....	.....	.....	98	99,898	1,944	155	173,642	3,816
1890	12	6,436	127	1	101	14	88	94,285	1,828	101	100,822	1,969
1891	7	3,921	75	.....	.....	.....	51	56,300	932	58	60,221	1,007
1892	7	4,268	92	.....	.....	.....	59	72,702	1,264	66	76,970	1,356
1893	6	6,313	110	1	296	8	67	92,248	1,494	74	98,857	1,612
1894	5	6,237	118	1	296	8	60	101,629	1,714	66	108,162	1,840
1895	5	5,902	89	.....	.....	.....	66	100,843	1,929	71	106,745	2,018
1896	7	8,913	127	.....	.....	.....	44	73,656	1,282	51	82,519	1,409

COMMERCE.

Year.	Value of exports.	Value of imports.	Duties collected.
1888	$850,393.00	$65,645.36	$17.00
1889	1,083,085.00	24,266.00	160.00
1890	1,040,197.00	41,005.00	.....
1891	627,851.00	137,942.54	31.50
1892	791,554.00	77,751.49	.....
1893	2,251,685.50	19,278.81	9.00
1894	4,939,417.00	59,054.00	182.06
1895	4,155,619.00	70,382.32	1,529.00
1896	4,316,259.00	135,482.62	1,490.40

MARION M. HUTSON, *Collector of Customs.*

Arrivals and clearances of vessels and commerce at Beaufort, S. C., etc.—Continued.

COMMERCE IN 1891.

Articles.	Quantity.	Value.
Lumber, timber, railroad ties.....feet..	4,120,000	$37,500
Shingles.....number..	100,000	500
Wood.....cords..	600	1,800
Coal.....tons..	7,300	29,000
Phosphate rock.....do....	173,000	820,000
General merchandise, machinery, hardware, etc.....do....	9,150	300,000
Lint cotton, seed cotton.....do....	1,600	140,000
Rough rice.....do....	1,000	50,000
Total.....	.....	1,378,800

Aggregate tons of freight transported through Brickyard Creek during the year was 202,235 tons.

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek during the year 1891.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips.
Passenger boats	3	900	$40,000	140
Tugboats	16	1,000	170,000	1,500
Dredges, wash boats, lighters	37	6,000	280,000	5,500
Coastwise vessels	20	10,000	500,000	20
Steam pleasure yacht	.....	250	203,000	15
Small boats from 2 to 50 tons	30	400	12,000	500
Pilot boats	3	100	10,000	75
Revenue cutter	2	1,100	160,000	30
Buoy tender	1			
Fish Commission boat	1			
Total	.....	19,750	1,875,000	7,780

Five thousand passengers passed over the creek during the year.

COMMERCE IN 1892.

Articles.	Quantity.	Value.
Phosphate rock.....tons..	200,000	$880,000
General merchandise, machinery, hardware, etc.....do....	10,000	300,000
Lint cotton, seed cotton, cotton seed.....do....	11,000	200,000
Rough rice.....do....	1,000	30,000
Coal.....do....	10,000	40,000
Lumber, timber, railroad ties.....feet B. M..	5,120,000	51,500
Shingles.....number..	100,000	500
Wood.....cords..	1,000	3,000
Total.....tons..	250,000	1,505,000

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek during the year 1892.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips.
Passenger boats	3	900	$40,000	225
Tugboats	18	1,100	180,000	1,550
Dredges, wash boats, lighters	37	6,000	280,000	5,500
Coastwise vessels	20	10,000	500,000	20
Steam pleasure yachts	10	300	200,000	30
Small boats from 2 to 50 tons	30	400	1,200	500
Pilot boats	3	100	10,000	75
Revenue cutters	2	700	175,000	50
Buoy boat	1			
Total	.....	19,500	1,386,200	7,950

Aggregate tonnage, value, etc.—Continued.

COMMERCE IN 1893.

Articles.	Number.	Tons.	Value.
Phosphate rock		180,000	$900,000
General merchandise		2,250	112,500
Cotton seed		50	1,000
Sea-island and upland cotton		60	25,000
Coal		6,000	25,000
Lumber and timber, feet B. M.	7,900,000	25,140	79,000
Railroad ties	61,700		18,500
Wood, shingles, brick, hardware, machinery, etc		1,500	20,000
Total		215,000	1,181,000

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek, during the year 1893.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips.
Passenger boats	3	900	$40,000	150
Tugboats	18	1,100	130,000	1,300
Wash boats, dredges, and lighters	37	6,000	250,000	4,000
Coastwise vessels	20	10,000	500,000	20
Steam pleasure yachts	10	300	200,000	30
Small boats from 2 to 50 tons	30	400	1,200	400
Pilot boats	3	100	10,000	50
Revenue cutters	2	700	175,000	50
Buoy tender	1			
Total		19,500	1,306,200	6,000

COMMERCE IN 1894.

Articles.	Number.	Tons.	Value.
Phosphate rock		150,000	$525,000
Lumber, sawed and hewed, feet B. M.	8,000,000	30,000	80,000
Railroad ties	60,000		18,000
General merchandise		8,000	190,000
Sea-island cotton		110	40,000
Cotton seed		175	2,000
Coal		8,000	30,000
Wood, shingles, brick, machinery		2,000	35,000
Rough rice, seed cotton (not ginned)		700	30,000
Total		193,985	950,000

W. D. NILES.

Capt. F. V. ABBOT, *Corps of Engineers.*

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek during the year 1894.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips, single.
Tugboats	19	1,150	$150,000	1,500
Coastwise	20	10,000	500,000	20
Steam pleasure yachts	12	400	225,000	75
Small boats from 2 to 50 tons	40	500	6,000	500
Wash boats and dredges	10	8,000	200,000	10
Lighters	60	6,000	50,000	5,000
Pilot boats	4	185	10,000	100
Revenue cutters	2	700	175,000	50
Buoy tender	1			
Passenger boats (steam)	4	1,000	60,000	200
Total		22,935	1,376,000	7,455

Aggregate tonnage, value, etc.—Continued.

COMMERCE IN 1895.

Articles.	Number.	Tons.	Value.
Phosphate rock		150,000	$450,000
Lumber, sawed and hewed ..... feet B. M.	4,000,000	10,000	36,000
General merchandise		8,000	190,000
Sea-island cotton (ginned)		350	150,000
Seed cotton (not ginned)			
Rough rice		700	30,000
Cotton seed		250	3,750
Coal		8,000	30,000
Wood, shingles, brick, machinery, and hardware		2,000	30,000
Total		174,300	919,750

W. D. NILES.

Capt. F. V. ABBOT, *Corps of Engineers.*

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek for year 1895.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips.
Tugboats	20	1,200	$140,000	1,600
Coastwise	15	7,500	375,000	20
Pleasure yachts (steam and sail)	15	500	225,000	100
Small boats from 2 to 50 tons	40	500	6,000	500
Wash boats and dredges	10	3,000	200,000	15
Lighters	60	6,000	50,000	5,000
Pilot boats	4	185	10,000	100
Revenue cutters	2	700	175,000	50
Buoy tenders	1			
Passenger boats (steam)	4	1,000	60,000	200
Total	171	20,585	1,221,000	7,585

COMMERCE IN 1896.

Class.	Number.	Aggregate tonnage.	Aggregate value.	Aggregate number of trips.
Tugboats	18	1,100	$110,000	1,200
Coastwise	15	7,500	350,000	15
Steam pleasure yachts and sailing yachts	10	400	200,000	50
Small boats from 2 to 50 tons	40	500	6,000	400
Wash boats and dredges	10	3,000	200,000	15
Lighters	60	6,000	50,000	3,000
Pilot boats	5	250	20,000	60
Revenue cutters	2	700	175,000	40
Buoy-tender boats	1			
Passenger boats (steam)	4	1,000	60,000	150
Total	.....	20,450	1,171,000	4,930

Articles.	Number.	Tons.	Value.
Phosphate rock		80,000	$180,000
Lumber, sawed and hewed (including railroad ties) ..... feet	6,200,000	15,000	52,000
General merchandise, including machinery		2,500	150,000
Sea island and upland cotton ..... bags	2,100	367	127,000
Cotton seed		850	12,000
Rough rice and seed cotton (cotton not ginned)		800	35,000
Coal, wood, brick, shingles, shells, lime		750	82,000
Total		100,267	538,000

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1897.

CAPTAIN: I have the honor to submit the following annual report for Beaufort River, South Carolina:

An informal contract was made with P. Sanford Ross to dredge the rock and sand in the Coosaw mouth of Brickyard Creek, at $1.07 per cubic yard

Dredging operations were commenced October 8, 1896, near the west end of shoal on what we have generally called the "Coosaw Range." Cut 4 was dredged for a length of about 400 feet, the eastern end having been made 30 to 35 feet wide. Cut 6 was dredged about 30 feet wide at the western end and 10 to 15 feet wide on the eastern end. The total length of this cut was about 200 feet. As the balance of this cut was already about 7 feet deep at low water and funds were nearly exhausted, no more work was done. These two cuts are both south of the center range, the cuts to the north being numbered 1, 3, etc. The project requires 7 feet depth at low water, but considerably over depth was permitted and encouraged, because, as had been anticipated, the dredge left a ridge on the north side of No. 4 and on the south side of No. 6. The plan proposed contemplated hauling the loose pieces of rock forming these ridges into the deep water of the cuts, and thus securing the requisite depth and disposing of the ridges. The material removed was rock, sand, and some mud. It was dumped as follows: 2,436 cubic yards in McCally Creek, 1,170 cubic yards in Coosaw River, 126 cubic yards in Brickyard Creek. This last was accidentally dumped near Mr. Reid's wharf, but was allowed and paid for, as it did not interfere with traffic or the use of the wharf. The total number of cubic yards removed was consequently 3,732.

Finding that it was impracticable with Mr. Ross's dredge to avoid the formation of the ridge, and that she was not arranged to remove this ridge economically, a smaller dredge belonging to Reid Bros., from Beaufort, S. C., was engaged at $35 per day. This was one of the phosphate dredges used on Coosaw River. She worked upon a different principle. The dipper was attached to a frame projecting from the bow of the dredge, and was so arranged as to be hauled toward the machine instead of being forced out from it. The work of removing the ridges with this machine was successful. She worked from November 16 to December 7, and the Messrs. Reid were paid for fourteen and nine-tenths days at $35 per day. As much as possible of the ridges on the north side of Cut 2 and south side of Cut 6 was removed, and also some pieces which had been piled up at the eastern ends of the cut.

This work was very ably and efficientiy inspected by Mr. W. D. Niles. Mr. Niles arranged to sound and sweep the area as thoroughly as he could, in order to detect and remove the broken pieces forming the ridges.

The channel is still too narrow, only Cuts 1, 2, 4, and 6, of about 25 feet each, having been made. The character of the bottom at this place calls for a greater width. Should the balance of the estimate for this improvement be made available at one time, a more advantageous arrangement could be effected for the completion of the work.

Respectfully submitted.

JAMES P. ALLEN, *Assistant Engineer.*

M 13.

ESTABLISHMENT OF HARBOR LINES IN ASHLEY AND COOPER RIVERS, AT CHARLESTON HARBOR, SOUTH CAROLINA.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., September 21, 1896.

SIR: The General Government has expended large sums of money in improving the harbor at Charleston, S. C., the adopted project for its improvement having been completed not long since. No harbor lines have been established by the Secretary of War for this harbor, and there appears to be no settled limits for the extension of wharves and docks into the harbor. It is believed to be highly important to the preservation and protection of the harbor that such lines be estab-

lished under the provisions of section 12 of the river and harbor act of September 19, 1890.

I accordingly have the honor to recommend that a board of officers of the Corps of Engineers, to consist of Col. Peter C. Hains, Maj. W. T. Rossell, Capt. F. V. Abbot, with Additional Second Lieut. Edwin R. Stuart as recorder, be constituted, to consider and report upon the subject of the establishment of harbor lines in Charleston Harbor and Ashley River, the expenses of the Board to be paid from the funds available for the improvement of the harbor.

With the sanction of the Secretary, the order constituting the Board will be issued from this office.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

[First indorsement.]

WAR DEPARTMENT, *September 23, 1896.*

Approved.
By order of the Secretary of War:

JOHN TWEEDALE, *Chief Clerk.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
August 7, 1897.

Respectfully returned to the Secretary of War.

The Board of Engineers, constituted by authority of the Secretary of War in first indorsement hereon, has given the subject of harbor lines in Charleston Harbor careful consideration, and submits the accompanying report, dated the 3d instant, with map, on which are delineated the pierhead and bulkhead lines which the Board considers best suited to the desires and interests of riparian owners and to the requirements of the Ashley and Cooper rivers, as respects their tidal area and regimen of flow, both ebb and flood.

I recommend that the lines selected be approved, and that the Secretary place his approval upon the map* which has been prepared for his signature.

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

To Chief of Engineers, with map, approved August 10, 1897.

REPORT OF BOARD OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., August 3, 1897.

GENERAL: The Board of Officers of the Corps of Engineers, constituted by paragraph 1, special orders, No. 33, headquarters Corps of Engineers, dated Washington, September 25, 1896, consisting of Col. Peter C. Hains, Maj. Wm. T. Rossell, Capt. Frederic V. Abbot, Addi-

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*Not printed.

tional Second Lieut. Edwin R. Stuart, recorder, has the honor to report as follows:

In accordance with the requirements of the above order and of your letter dated Washington, D. C., September 30, 1896 (Appendix C*), two meetings were held. One of them was public and fully attended by parties in interest, whose opinions were asked and are recorded in Appendix B* to this report.

A careful inspection of the water fronts in question was made. After full discussion and mature deliberation, the pierhead lines and bulkhead lines shown on the accompanying map were selected as best suited to the desires and interests of the riparian owners and to the requirements of the Ashley and Cooper rivers, as respects their tidal areas and regimen of flow, both ebb and flood.

In order that these lines may be reproduced, the coordinates of all angular points are given in Appendix A to this report. They are referred to the center of the spire of Flinn's Church, Charleston, S. C. For convenience in marking the lines at any time, the coordinates of fifty permanent reference points on the Cooper River front and twenty-one on the Ashley River front are given. In addition to these the coordinates of twenty-eight permanent reference points, consisting of church steeples, permanent Coast Survey stations, and corners of brick buildings, are given. These coordinates are tabulated in Appendix A to this report, and the same tables are given in full on the map accompanying this report.

PETER C. HAINS,
Colonel, Corps of Engineers.
WM. T. ROSSELL,
Major, Corps of Engineers.
FREDERIC V. ABBOT,
Captain, Corps of Engineers.
EDWIN R. STUART,
Addl. Second Lieutenant of Engineers, Recorder.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

APPENDIX A.

The map accompanying this report was prepared from surveys made by the Engineer Department in 1881, 1886, and 1893, by the United States Coast and Geodetic Survey in 1889–1894, and under the direction of the Board of Engineers for harbor lines in 1897. A system of rectangular coordinates is used, the origin being the center of the cupola of Flinn's Church, and the directions parallel and perpendicular to the true meridian at that point. The steeples and other conspicuous objects and points are given in Table No. 1 by their coordinates. The coordinates of a number of reference points are given in Table No. 2. These last consist generally of corners of brick buildings. Unless otherwise stated, the intersection of the main walls above the water table (where there is one) is the located point, and not the corner as it shows at the ground. These reference points are shown on the map by small +'s and are numbered consecutively, No. 1 being farthest north on Ashley River side. The numbering continues around the southern part of the city and up Cooper River. The coordinates are in feet and tenths.

Soundings are in feet and tenths referred to mean low water. The 1-fathom curve is shown in yellow, 2-fathom curve in red, 3-fathom curve in blue, 4-fathom curve in green, and 5-fathom curve in black.

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* Not printed.

Table No. 1.

Designation.	Latitude.	Departure.	Description.
Flinn's church			Center of cupola, Flinn's Presbyterian church.
Cotton factory chimney	3419.5 N	155.6 W	Center of chimney, Charleston cotton factory.
German church	725.6 S	933.8 W	Spire St. Johannes' German Lutheran church.
St. Philip's	3562.0 S	1457.7 E	St. Phillip's church spire.
St. Michael	4542.1 S	1001.6 E	St. Michael's church spire.
Scotch church	5248.9 S	965.5 E	Southern cupola of Scotch Presbyterian church.
Geo. W. Williams' house	6269.9 S	1287.2 E	Cupola residence of Geo. W. Williams, sr.
Baptist church	529.1 S	126.6 W	Spire Citadel Square Baptist church.
Wappoo tank	5066.7 S	6583.5 W	Center of tank, Wappoo Mill.
Orphan House	947.1 S	1102.1 W	Figure on cupola of Orphan House.
Lutheran	3595.9 S	122.5 W	Center cupola Lutheran church, Archdale street.
Grace church	2633.8 S	788.8 W	Spire Wentworth street.
△ Battery	7071.8 S	1650.0 E	Southeast angle of sea wall.
△ Plum	10152.6 S	4988.3 W	C. & G. S. △ Plum Island. Stone with hole.
△ Old Town	4769.9 N	14818.2 W	C. & G. S. △ near landing of Mr. E. T. Legaré, marked by a stone with hole drilled in it.
△ Legaré	8521.4 N	15103.2 W	C. & G. S. △. Stone with hole in it.
△ Sand Hill	12116.0 N	14007.7 W	C. & G. S. △. Stone with hole. On Sunday Hill Point. Place of Mr. Legaré.
△ Doctor	15289.1 N	15977.2 W	C. & G. S. △ on Doctor Point. Cedar Point.
Doctor reference mark.	15250.7 N	15961.5 W	Piece of drain pipe filled with cement and bottle of ashes under it. It is S. 22° 12′ 30″ E. 41. 46 feet from △ Doctor. Place of Mr. Legaré.
△ Danmon	3640.5 N	9941.4 W	C. & G. S. △ near old race track.
△ Pacific	8689.9 N	8186.8 W	C. & G. S. △ marked with a bottle. Stone marking city boundary SSE. 113 feet.
△ Wando	17457.9 N	11083.6 W	C. & G. S. △. Drain pipe and bottle. △ is 8′.9 from NW. and 17′.8 from SW. corner niter house.
△ Live Oak	20123.3 N	17531.2 W	C. & G. S. △. Drain pipe and bottle. A large oak is SE. 167.6 feet.
Pacific tank	10166.2 N	5878.1 W	Center of tank, Pacific Works.
Ashepoo tank	11617.8 N	7561.6 W	Center of tank, Ashepoo Works.
Stono tank	16350.1 N	9888.7 W	Center of tank, Stono Works.
Stono brick chimney	16096.1 N	9831.5 W	Center of brick chimney, Stono Works.
Wando brick chimney	17541.2 N	10837.3 W	Center of brick chimney, Wando Works.

Table No. 2.

Reference point.	Latitude.	Departure.	Description.
1	18320.4 N	11874.2 W	NW. corner brick building, Standard Works.
2	18274.7 N	11843.4 W	SW. corner brick building, Standard Works.
3	17611.5 N	11053.2 W	SW. corner acid chamber, Wando Works.
4	13564.8 N	8757.5 W	NW. corner brick chimney, 3 feet above batter of base at Atlantic Works.
5	2036.4 S	8628.9 W	Center of pivot pier, Ashley River Bridge.
6	3480.2 S	5211.6 W	NE. corner north wing, lower story, West Point Mill.
7	3565.8 S	5105.4 W	SE. corner south wing, lower story, West Point Mill.
8	3629.7 S	5153.3 W	SW. corner main building, lower story, West Point Mill.
9	3569.6 S	4948.9 W	NE. corner cistern back of warehouse, West Point Mill.
10	3508.6 S	4876.1 W	NE. corner small boiler room in rear of West Point Mill.
11	5441.4 S	2946.2 W	NW. corner Chisolm's Mill building.
12	5509.5 S	2885.5 W	SW. corner Chisolm's Mill building.
13	5375.8 S	2734.8 W	Reentrant angle rear of main building.
14	5552.4 S	2219.7 W	SW. corner of wall of Mr. Grimball's house, on causeway foot of Tradd street.
15	5538.8 S	2117.6 W	SE. corner of wall as above.
16	6559.1 S	266.8 W	NW. corner sea wall, west end South Bay, top.
17	6603.8 S	263.0 W	SW. corner sea wall, west end South Bay, top.
18	6553.9 S	217.8 W	SW. corner last house north side South Bay street.
19	6622.1 S	29.1 E	NW. corner brick foundation, Mr. Frost's house, south side South Bay street.
20	6605.7 S	667.2 E	SW. corner building at NE. corner King and South Bay streets.
21	6984.0 S	674.8 E	SW. angle battery sea wall, top.
22	5476.4 S	2322.5 E	SE. corner north brick building, southern wharf.
23	5423.0 S	2323.4 E	NE. corner north brick building, southern wharf.
24	5273.4 S	2322.5 E	NE. corner cotton shed, North Commercial wharf.
25	5238.7 S	2424.3 E	SE. corner warehouse, North Commercial wharf.
26	5196.2 S	2439.9 E	NW. corner office building, Commercial wharf.
27	4790.1 S	2460.6 E	NE. corner warehouse south side Adger, northern wharf.
28	4746.2 S	2397.1 E	SW. corner office building north side Adger, northern wharf.
29	4753.1 S	2547.4 E	SE. corner office building north side Adger, northern wharf.
30	4701.4 S	2549.5 E	NE. corner office building north side Adger, northern wharf.
31	4753.0 S	2612.8 E	SW. corner office building north side Adger, northern wharf, and east of railroad track.

Table No. 2—Continued.

Reference point.	Latitude.	Departure.	Description.
32.....	4721.3 S	2614.0 E	NW. corner of above.
33.....	4501.3 S	2610.1 E	SE. corner offices Boyce's wharf.
34.....	4366.6 S	2498.9 E	SW. corner Cotton Exchange.
35.....	4354.3 S	2547.9 E	Reentrant angle SE. Cotton Exchange.
36.....	4343.4 S	2647.5 E	SE. corner offices Atlantic wharves.
37.....	4307.4 S	2643.7 E	NE. corner offices Atlantic wharves.
38.....	4247.0 S	2638.8 E	SE. corner offices Atlantic wharves.
39.....	4211.9 S	2636.0 E	NE. corner offices Atlantic wharves.
40.....	3940.1 S	2608.5 E	SE. corner E. S. T. R. R. Co.'s offices.
41.....	3913.0 S	2606.8 E	NE. corner E. S. T. R. R. Co.'s offices.
42.....	3715.6 S	2570.4 E	NE. corner warehouse Clyde Steamship Co.'s southern wharf.
43.....	3660.5 S	2599.1 E	SE. corner offices west of track.
44.....	3624.2 S	2596.6 E	NE. corner offices west of track.
45.....	3669.5 S	2650.2 E	SW. corner offices east of track, Clyde Co.
46.....	3635.2 S	2648.2 E	NW. corner offices east of track, Clyde Co.
47.....	3547.3 S	2610.3 E	SE. corner warehouse, Clyde, northern wharf.
48.....	3350.4 S	2572.0 E	SE. corner offices Accommodation wharf.
49.....	3327.6 S	2567.5 E	NE. corner offices Accommodation wharf.
50.....	3082.6 S	2543.6 E	SE. corner offices Consumers' Coal Co.
51.....	3046.3 S	2539.8 E	NE. corner offices Consumers' Coal Co.
52.....	2963.2 S	2531.6 E	NE. corner main part south granite gatepost, custom-house.
53.....	2940.3 S	2529.2 E	SE. corner main part north granite gatepost, custom-house.
54.....	2958.8 S	2391.4 E	SE. corner south wing custom-house, about 18 inches above ground.
55.....	2918.9 S	2463.5 E	NE. corner plinth of southern lamp, eastern front custom-house.
56.....	2856.4 S	2456.3 E	SE. corner plinth of northern lamp, eastern front custom-house.
57.....	2350.2 S	2470.2 E	SE. corner boiler room Union Cotton Press.
58.....	2268.0 S	2460.5 E	NE. corner boiler room Union Cotton Press.
59.....	2151.6 S	2446.2 E	NE. corner brick cotton shed, Cotton Press.
60.....	1328.4 S	2293.1 E	NE. corner boiler room Bennett's mill.
61.....	1289.7 S	2264.0 E	NE. corner main building, Bennett's mill.
62.....	1053.9 S	2135.8 E	NW. corner electric-light building.
63.....	1033.6 S	2280.4 E	NE. corner electric-light building.
64.....	441.0 S	2316.1 E	SW. corner brick residence east side Concord street.
65.....	422.4 S	2314.1 E	NW. corner brick residence east side Concord street.
66.....	105.1 S	2460.4 E	SE. corner Standard Oil Co'.s brick warehouse on Inspection street.
67.....	126.9 S	2314.4 E	SW. corner same building as 66.
68.....	2.2 S	2270.1 E E	SW. corner Standard Oil Co.'s brick warehouse on Concord street.
69.....	47.6 N	2264.3 E	NW. corner same building as 68.
70.....	771.7 N	2024.0 E	SE. corner of furnace, east end gas works.
71.....	869.8 N	1949.0 E	NE. corner gas works.

NOTE OF TABLE NO. 3.—The pierhead line is shown in red.
The bulkhead line is shown in blue.
Existing solid structures outside of the bulkhead line may remain and be repaired, but may not be extended. No structure is to be built beyond said bulkhead line except on open pile work. No structure of any kind to be built outside of the pierhead line.
The pierhead and bulkhead lines are composed of straight lines connecting angular points, of which the coordinates, referred to the spire of Flinn's church and expressed in feet and tenths, are given in the following table:

Table No. 3.

Angular point.	Bulkhead line.		Pierhead line.	
	Latitude.	Departure.	Latitude.	Departure.
H	4479.3 N	1050.7 E	4528.0 N	1138.0 E
	3496.9 N	1599.0 E	.....	.....
G	.....	.....	2752.0 N	2129.0 E
	1722.0 N	1972.7 E	.....	.....
F	626.6 N	2372.7 E	772.0 N	2852.0 E
E	212.7 N	2473.9 E	301.0 N	2967.0 E
D	906.5 S	2602.5 E	872.0 S	3102.0 E
C	1565.2 S	2618.0 E	1555.0 S	3118.0 E
B	4195.8 S	2664.7 E	4205.0 S	3165.0 E
A	8095.7 S	2453.4 E	8838.0 S	2914.0 E
1	6637.1 S	940.6 W	7072.0 S	1195.0 W
2	4701.4 S	3472.9 W	5090.0 S	3788.0 W
3	3098.0 S	5340.0 W	3472.0 S	5672.0 W
4	2338.8 S	6166.8 W	2696.0 S	6517.0 W
5	1122.7 S	7329.0 W	1498.0 S	7662.0 W
6	960.0 N	10108.2 W	634.0 N	10507.0 W
7	2046.4 N	10624.1 W	1948.0 N	11131.0 W
8	3248.9 N	10551.5 W	3340.0 N	11047.0 W
9	5644.6 N	9789.9 W	5823.0 N	10268.0 W
10	7518.0 N	9280.0 W	7522.0 N	9500.0 W
11	9332.0 N	9000.0 W	9311.0 N	9177.0 W
12	10862.0 N	8822.0 W	10912.0 N	9038.0 W
13	12295.0 N	8830.0 W	12291.0 N	9116.0 W
14	14292.0 N	9345.0 W	14248.0 N	9554.0 W
15	15175.0 N	9640.0 W	15081.0 N	9952.0 W
16	16007.0 N	10020.0 W	15833.0 N	10351.0 W
17	17279.7 N	11009.2 W	16887.0 N	11327.0 W
18	17984.5 N	12193.3 W	17500.0 N	12357.0 W
19	18369.8 N	15547.0 W	17873.0 N	15604.0 W

APPENDIX N.

IMPROVEMENT OF RIVERS AND HARBORS IN EASTERN GEORGIA.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Savannah Harbor, Georgia.
2. Savannah River, Georgia.
3. Savannah River, above Augusta, Georgia.
4. Darien Harbor, Georgia.
5. Altamaha River, Georgia.
6. Oconee River, Georgia.
7. Ocmulgee River, Georgia.
8. Brunswick Harbor, Georgia.
9. Cumberland Sound, Georgia.
10. Inside water route between Savannah, Georgia, and Fernandina, Florida.
11. Removing sunken vessels or craft obstructing or endangering navigation.

SURVEY.

12. Doboy Bar, Georgia.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1897.

GENERAL: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1897, upon the works of river and harbor improvements then in my charge.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

N 1.

IMPROVEMENT OF SAVANNAH HARBOR, GEORGIA.

Savannah Harbor proper is formed by the navigable part of the tidal portion of Savannah River lying within and below the limits of the city of Savannah—that is, Front River and North Channel from the Central Railroad Pier down to the sea. In a wider sense of the word the term Savannah Harbor comprises both branches of the river—that is, Front River-North Channel and Back River-South Channel from Cross Tides down to the sea.

ORIGINAL CONDITION.

In 1873, before the work of improvement was inaugurated, the usual draft of vessels navigating the river at high water was 14.5 feet. The mean rise and fall of the tide was about 6.5 feet at the city of Savannah and 7 feet at the mouth of the river.

PLAN OF IMPROVEMENT.

The original plan for the improvement of Savannah Harbor is dated August 28, 1873; that was supplemented by the project of March 19, 1879, and both of those projects were replaced by the third or enlarged project of January 16, 1882, which is given in Appendix J 4, Annual Report of the Chief of Engineers for that year, where also the earlier projects are outlined.

In 1887, in obedience to an act of Congress approved August 5, 1886, a project with estimates of cost of improvement for obtaining 28 feet of water from the city of Savannah to the sea was submitted and is outlined in Appendix N 1, Annual Report of the Chief of Engineers for 1888.

On June 30, 1890, a new project was submitted providing for a mean high-water depth of 26 feet from the city to the sea. This project, which is printed as part of Appendix O, Annual Report of the Chief of Engineers for 1890, was adopted July 22, 1890. The work contemplated by it was practically completed at the end of the fiscal year of 1896, and during the fiscal year just closed only repair work and a small amount of dredging was carried on in accordance with it.

In compliance with instructions from the Department, dated August 20, 1894, I submitted on December 7, 1894, a modified plan of improvement providing for a detached extension of the Oyster Bed training wall for the purpose of sheltering the anchorage in Tybee Roads as well as for protecting the ship channel over the outer part of Tybee Knoll against the destructive action of heavy storms. This project, which is printed as part of Appendix M 1, Annual Report of the Chief of Engineers for 1895, was authorized by law of June 3, 1896, and in accordance with it work has been carried out during the fiscal year just ended.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

A detailed summary of the jetty work done prior to June 30, 1890, is given in my report for 1891 (Report of the Chief of Engineers for 1891, p. 1492 and following). A summary of obstructions removed and of dredging done during the same period will be found in my report for 1896 (Report of the Chief of Engineers for 1896, p. 1213).

A summary of the jetty work and the dredging done under the new project from July 1, 1890, to June 30, 1896, will be found in my report for 1896 (Report of the Chief of Engineers for 1896, pp. 1218–1220).

CONDITION OF WORK JUNE 30, 1896.

The least practicable channel depth from the old water works to the Ocean Steamship Company's wharves was 15 feet at mean low water; thence down to the lower end of Marsh Island there was a practicable channel depth of 18 feet at mean low water; thence down to the ocean

there was a channel of a depth not less than 20 feet at mean low water (26 feet at mean high water) with a least width of about 240 feet. All of the works from Marsh Island down were in good condition.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

The river and harbor act approved June 3, 1896, contained an appropriation of $5,000 for continuing this improvement, with the following provisions:

Provided, That contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the project of further improvement recommended by Capt. O. M. Carter in his reports of December 7, 1894, and July 1, 1895, and to complete the project for the steamboat channel between Beaufort, S. C., and Savannah, Ga., recommended by Capt. O. M. Carter in his report of December 4, 1895, and mentioned in that report as route 2; to be paid for as appropriations may from time to time be made by law, not to exceed the amount of $1,000,000, exclusive of amount herein or heretofore appropriated.

Under this provision a contract was entered into with Rittenhouse R. Moore, of Mobile, Ala., for all of the dredging, and with the Atlantic Contracting Company, of New York, N. Y., for all jetty work required for the improvement.

Jetty work, under contract of October 8, 1896, with the Atlantic Contracting Company, was commenced December 3, 1896, and has been continued to the end of the fiscal year.

There were put into the detached extension of the Oyster Bed training wall 165,038.87 square yards of brush mattresses and 14,690.02 cubic yards of fourth-class stone. A length of 5,250 feet of this dam was built.

There were put into the Cockspur training wall 14,318.33 square yards of brush mattresses and 751.67 cubic yards of fourth-class stone. This wall was lengthed 200 feet.

There were put into Dam No. 31, 38,963.22 square yards of brush mattresses and 2,269 cubic yards of fourth-class stone. This dam was carried to the shore of Turtle Island, a distance of about 2,500 feet, thus closing the gap that had been left.

There were driven on Oyster Bed training wall 4 piles to serve as guides, and there were driven on Dam No. 31, 75 piles for the same purpose. Altogether there were, therefore, driven 79 piles to serve as guides, which are an equivalent to 316 linear feet of pile dam.

In repairing the Jones Island and the Elba Island spur dams there were driven 32 piles, making 128 linear feet of pile dam; there were also driven 9⅔ clusters of piles, making a total of 61 piles.

In repairing the Garden Bank training wall there were driven 73 piles, making 292 linear feet of pile dam; there were also driven 7 clusters of piles, making a total of 94 piles; there were used 11,850 feet B. M. of timber, as waling and ties, and 1,632.7 pounds of iron bolts to secure them to the pile work.

All the above repair work was done in open market by the Atlantic Contracting Company at the prices of their contract of October 22, 1892.

Altogether there were, therefore, put into the various works by the Atlantic Contracting Company during the fiscal year:

Brush mattresses	square yards..	218,320.42
Fourth-class stone	cubic yards..	17,710.69
Sawed timber	feet B. M..	11,850
Iron bolts	pounds..	1,632.70
Pile work	linear feet..	736
Fender piles	clusters..	16⅓

Dredging, under contract of October 20, 1892, with P. Sanford Ross, of Jersey City, N. J., was continued until July 31, when the work was completed. The following quantities of material were removed at various points:

	Cubic yards.
1. Marsh Island Channel	43,916.3
2. Front River	8,483.4
3. Wrecks Channel	15,161.1
4. Upper Flats	15,239.3
5. Long Island Crossing	33,355.0
6. New channel over Tybee Knoll	27,486.3
Total	143,641.4

In all, therefore, 143,641.4 cubic yards of material were removed under this contract from the channel in Savannah Harbor during the fiscal year.

Dredging, under contract of October 6, 1896, with Rittenhouse R. Moore, of Mobile, Ala., was commenced on January 12 and continued to the end of the fiscal year. The following quantities were removed:

	Cubic yards.
1. Ramshorn Creek	52,333.5
2. Wrights River	81,364.8

In all, therefore, 133,698.3 cubic yards of material were removed under this contract from Ramshorn Creek and Wrights River during the fiscal year.

SUMMARY OF ENTIRE WORK DONE UNDER THE PROJECT OF 1890.

A summary of the entire jetty work done under the project of 1890 is given in my report for 1896 (Report of Chief of Engineers for 1896, pp. 1218 and 1219).

Dredging under the same project was done under two contracts with P. Sanford Ross, one dated November 11, 1890, and one dated October 20, 1892. Besides this, 664.30 cubic yards of material was dredged under special authority and outside of contracts in November, 1891. The total quantities removed at the various locations under the project are as follows:

No.	Locality.	Removed.	Length of dredged channel cut.
		Cubic yards.	*Feet.*
1	Partial removal of Kings Island	126,850.40	.....
2	Partial removal of Marsh Island	36,920.10	.....
3	Marsh Island Channel	1,013,469.76	9,600
4	Front River in front of city	522,111.40	10,500
5	Wrecks Channel	667,507.00	7,000
6	Obstructions	261,642.00	5,500
7	Upper Flats	302,579.80	7,000
8	Lower Flats	369,628.10	5,900
9	Long Island Crossing	1,072,401.80	17,700
10	Oyster Bed Shoal	193,392.71	1,400
11	Long Island Light Range	783,704.79	8,200
12	Oyster Lump near Long Island Range	63,785.90	.....
13	Old Channel, Venus Point Range	13,241.20	.....
14	New channel over Tybee Knoll	607,512.50	8,900
15	Outer Bar	2,616.00	.....
	Total	6,037,363.46	81,700

CONDITION OF WORK JUNE 30, 1897.

No dredging has been done in Savannah Harbor during the fiscal year since July, 1896.

The least practicable channel depth in the upper half of Marsh Island Channel is 15 feet at mean low and 20 feet at mean high water; in the lower half of Marsh Island it is 18 and 23 feet, respectively; from the Central Railroad elevator to West Broad street, 20 and 25½ feet, respectively, and thence down to Tybee Roads 20.2 and 26 feet, respectively. The works of improvement are in good order. When the present condition of the river bed is compared with that of a year ago, it is found that considerable shoaling has taken place in Marsh Island Channel; thence down to Wrecks Channel the size of the river bed has about held its own; in the lower part of Wrecks Channel, at Obstructions and at Upper and Lower flats, the river bed between the training wall has on the whole increased somewhat; on the upper part of Long Island Crossing slight shoaling has taken place; thence down to Tybee Roads the river bed has either held its own or increased in size.

COMMERCE AND NAVIGATION.

A full statement and discussion of the commerce of Savannah were given in my annual report for 1890, to which I respectfully refer for details in this connection.

The railroads now centering in Savannah are the Charleston and Savannah, the South Bound, the Georgia Central, the Savannah, Americus and Montgomery, and the Florida Central and Peninsular. The railroads under construction are the Macon and Atlantic and the Macon and Dublin.

In addition to the railroads, the Savannah River, navigable as far as Augusta, a distance of 202 miles by the river, for boats drawing from 4 to 5 feet, affords another means of communication with the interior, and many small steamers and sailing craft ply the waters of the inland route, along the adjacent coasts, gathering the products of the sea and of the coast plantations for transshipment at Savannah.

These avenues of commerce bring to Savannah the cotton, lumber, naval stores, and farm and mineral products of large portions of the States of Georgia, South Carolina, Florida, Alabama, and Tennessee, as well as other classes of through freights from the West and Northwest.

Regular lines of steamships have been established between this port and Boston, New York, Philadelphia, and Baltimore. These lines comprise a total of 11 steamships, of which 4 are to New York, 3 to Boston, 2 to Baltimore, and 2 to Philadelphia. They made during the last calendar year about 369 voyages and carried about 465,621 tons of freight.

On the inland waters there is a number of small steamers plying between Savannah and adjacent ports, making annually from 500 to 600 trips, and carrying about 67,000 tons of freight, valued at about $4,000,000.

The chief articles of export are cotton, lumber, and naval stores, of which the present annual shipments may be given in round numbers as follows: Of cotton, 784,983 bales; of lumber, 107,000,000 feet, and of naval stores, 329,445 barrels of turpentine and 1,311,950 barrels of rosin.

The total tonnage of the port, inward and outward bound, during 1896 was 1,350,056 tons.

MISCELLANEOUS.

The work is located in the collection district of Savannah, Ga. Savannah is the nearest port of entry. Amount of duties collected in 1896, $36,149.81. The nearest light-houses are those upon the river, and Forts Oglethorpe and Pulaski are the nearest forts.

In my last annual report I indicated the importance of enlarging the river bed by extensive dredging, in order to facilitate the entrance of the tide, thereby increasing its range and volume and, consequently, the stability of the improvement. In referring here to what was said on this subject in my last annual report (Report of the Chief of Engineers for 1896, p. 1222 and following), I desire to add that rapid shoaling has taken place behind the training walls. In the case of the North Elba Island training wall, the shoaling has reached a stage when marsh grass is commencing to grow between the wall and the old shore. In the course of a few years this space probably will be converted into a grass-covered marsh and cease to form a part of the river. A corresponding loss of volume of the tidal prism will then result, unless timely measures are taken to compensate for such loss. These measures, which are fully discussed in my last annual report, consist in enlarging the river bed between the training walls, especially at the most contracted points, by dredging, commencing in the lower regions of the harbor and gradually advancing upstream. The above-described present conditions form an additional weighty reason why the work outlined should be authorized without delay. For the opening of the river to the size contemplated in the project of 1890, about 2,500,000 cubic yards of material should yet be removed by natural scour or by dredging. This would improve the existing tidal conditions, but possibly not fully restore those of 1890. To reobtain the size which the river bed had at that time would require the removal of about 9,000,000 cubic yards of material. These figures indicate, then, the inferior and superior limits of enlargement that the river bed will require in order to increase tidal range and volume to their former size.

I once more urgently recommend, therefore, that funds be made available for this purpose. A failure to do so will result in gradual deterioration of the river bed and thus threaten the future of the improvement. As has been stated in former reports, the channel in the harbor of Savannah, especially in its upper parts, will probably never become entirely self-maintaining, on account of the great mass of sediment which the river carries down from above; but the annual outlay required for maintenance will be the smaller the more powerful the tide that moves in the river bed.

Besides the dredging work described above, provision should be made for maintenance, for which purpose, under the present conditions, probably $50,000 annually will be required.

Of the unexpended balance of $4,035.05 from the appropriation of August 11, 1888, there was required for obligations contracted under the former project of improvement the sum of $157.44, leaving an available balance of $3,877.61 for expenditure under the 26-foot plan of improvement.

When the 26-foot plan of improvement was completed there was an unexpended balance of $44,485.06, inclusive of outstanding liabilities of $27,500, leaving an available balance of $16,985.06, which was brought forward to be expended under the existing project of improvement.

Money statement.

July 1, 1896, balance unexpended		$49,485.06
Amount appropriated by sundry civil act approved June 4, 1897		350,000.00
		399,485.06
June 30, 1897, amount expended during fiscal year		33,702.17
July 1, 1897, balance unexpended		365,782.89
July 1, 1897, outstanding liabilities	$275,478.62	
July 1, 1897, amount covered by uncompleted contracts	724,010.43	
		275,478.62
July 1, 1897, balance available		90,304.27
Amount (estimated) required for completion of existing project		793,950.00
Amount that can be profitably expended in fiscal year ending June 30, 1899, including $100,000 for maintenance		893,950.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

From 1826 up to the date of the 22-foot plan of improvement appropriations amounting to $667,096.64 were made for the improvement of the harbor and for the removal of wrecks, as follows:

By act of Congress of—		By act of Congress of—	
March 18, 1826	$50,000.00	August 30, 1852	$40,000.00
March 3, 1829	24,490.00	March 3, 1855	161,000.00
July 3, 1832	25,000.00	June 10, 1872	50,000.00
March 2, 1833	43.06	March 3, 1873	50,000.00
March 2, 1833	8,430.62	February 27, 1874	193,132.96
June 28, 1834	30,000.00		
March 3, 1835	20,000.00	Total	667,096.64
July 7, 1838	15,000.00		

Under the 22-foot plan of improvement the following appropriations were made:

By act of Congress of—		By act of Congress of—	
June 23, 1874	$50,000.00	August 5, 1886	$150,000.00
March 3, 1875	70,000.00	August 11, 1888	180,000.00
August 14, 1876	62,000.00		1,212,000.00
June 18, 1878	70,000.00		
March 1, 1879	100,000.00	Unexpended balance of last appropriation carried to new project	4,035.05
June 14, 1880	65,000.00		
March 3, 1881	65,000.00		
August 2, 1882	200,000.00		
July 5, 1884	200,000.00	Total	1,207,964.95

Under the 26-foot plan of improvement the following appropriations have been made:

By act of Congress of—		
August 11, 1888 (unexpended balance)		$4,035.05
September 19, 1890		350,000.00
July 13, 1892		318,750.00
March 3, 1893		1,000,000.00
August 18, 1894		975,000.00
March 2, 1895		856,250.00
		3,504,035.05
Amount deposited by clerk of United States circuit court for the southern district of Georgia, March 20, 1895		500.00
		3,504,535.05
Unexpended balance of last appropriation carried to new project		44,485.06
Total		3,460,049.99

Since the existing project for improving Savannah Harbor was adopted the following appropriations have been made:

By act of Congress of—	
March 2, 1895 (unexpended balance)	$44,485.06
June 3, 1896	5,000.00
June 4, 1897	350,000.00
Total	399,485.06

Abstract of bids opened at Savannah, Ga., September 8, 1896, by Capt. O. M. Carter, Corps of Engineers, for improving harbor at Savannah, Ga.

No.	Name and address of bidder.	Mattresses (200,000 sq. yds).		First-class stone (25,000 tons).		Second-class stone (25,000 tons).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.
2	P. Sanford Ross, Jersey City, N.J	$0.90	$180,000	$4.80	$120,000	$4.80	$120,000
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N.Y. *a*	.95	190,000	3.90	97,500	3.90	97,500
7	John L. Grim, Philadelphia, Pa	.98	196,000	4.00	100,000	4.00	100,000

No.	Name and address of bidder.	Third-class stone (50,000 cubic yards).		Fourth-class stone (100,000 cubic yards).		Total for jetty work.	Dredging 1,250,000 cubic yards.	
		Price.	Amount.	Price.	Amount.		Price.	Amount.
1	Virginia Dredging Co., J. Clements Shafer, secretary and treasurer, Richmond, Va. *b*						$0.16 2/10	$211,500
2	P. Sanford Ross, Jersey City, N.J.	$3.55	$177,500	$2.60	$260,000	$857,500	.17 2/10	223,750
3	Savannah Dredging Co., Jacob Paulsen, president, Savannah, Ga						.20½	256,250
4	American Dredging Co., S. Y. Schermerhorn, president, Philadelphia, Pa. *c*						.22	275,000
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N.Y. *c*	3.50	175,000	2.75	275,000	835,000		
6	Rittenhouse R. Moore, Mobile, Ala. *						.13	162,500
7	John L. Grim, Philadelphia, Pa.	3.30	165,000	2.90	290,000	851,000		

REMARKS.—Amount for which the Secretary of War is authorized to enter into contracts, $1,005,000.

a It is recommended that the bid of the Atlantic Contracting Company, of New York, John F. Gaynor, president, for jetty work (the first five items), and of Rittenhouse R. Moore, of Mobile, Ala., for dredging (item 6), be accepted, they being the lowest responsible bidders for the best and most suitable materials and service.

b Bond of $50,000 submitted instead of $250,000, as required.

c Evidence of authority to bid not filed.

List of contracts in force.

Name and address of contractor.	Character of work.	Date of approval.	Work began.	Expires.
Rittenhouse R. Moore, Mobile, Ala.	Dredging...	Oct. 28, 1896	Jan. 12, 1897	On or before the expiration of one year after the total sum of money for which the Secretary of War is authorized to enter into contract under these specifications shall have been appropriated.
The Atlantic Contracting Co., John F. Gaynor, president, New York, N.Y.	Jetty	Oct. 27, 1896	Dec. 3, 1896	

COMMERCIAL STATISTICS.

Cotton statistics of the port of Savannah, Ga., for the commercial year ending August 31, 1896.

RECEIPTS FROM ALL SOURCES.

Grade.	Quantity.	Weight.	Value.
	Bales.	*Pounds.*	
Upland	707,564	344,831,315	$28,429,921
Sea island	77,419	30,145,510	5,313,265
Total	784,983	374,976,725	33,743,186

EXPORTS FROM SAVANNAH.

Destination.	Upland.	Sea island.
	Bales.	*Bales.*
Coastwise	336,440	62,742
Great Britain	24,913	10,473
France	24,433	1,966
Other continental ports	303,921	410
Mill consumption and burned	1,738	.....
Reshipped to interior	213	.....
Total	691,658	75,591

TOTAL EXPORTS.

Grade.	Foreign exports.	Coastwise exports.	Total.
	Bales.	*Bales.*	*Bales.*
Upland	355,218	336,440	691,658
Sea island	13,049	62,742	75,791
Total	368,267	399,182	767,449

Steamship lines.

Lines.	Savannah to—	Steamers.	Voyages.	Freight.
				Tons.
Ocean Steamship Co	New York	4	173	206,291
New England and Savannah Steamship Co	Boston	3	53	69,294
Merchants and Miners Transportation Co	Baltimore	4	104	143,746
Ocean Steamship Co	Philadelphia	2	39	46,290
Total	.....	13	369	465,621

Cotton receipts at Savannah, from 1872 to 1896.

Season August 31 to September 1.	Quantity.	Season August 31 to September 1.	Quantity.
	Bales.		*Bales.*
1872–73	612,794	1884–85	728,087
1873–74	630,372	1885–86	803,359
1874–75	614,478	1886–87	804,412
1875–76	523,244	1887–88	892,318
1876–77	477,435	1888–89	828,168
1877–78	597,449	1889–90	956,517
1878–79	693,764	1890–91	1,139,560
1879–80	741,018	1891–92	1,027,816
1880–81	889,383	1892–93	793,808
1881–82	737,056	1893–94	971,405
1882–83	817,760	1894–95	946,272
1883–84	655,749	1895–96	784,983

Arrival and clearance of vessels and commerce at Savannah, Ga., from January 1, 1878, to December 31, 1896.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
													Feet.
1878	463	88 95	11,884	34	18,140	382	213	118,316	2,989	710	817,951	15,316	17.50
1874	418	35 90	10,043	66	41,090	487	284	152,517	4,223	708	978,247	15,127	17.50
1875	370	91 97	10,102	67	39,533	781	222	145,743	3,200	659	495,923	14,173	17.50
1876	355	32 15	10,343	58	40,296	867	260	160,840	3,865	673	530,496	15,200	17.75
1877	333	37 96	10,867	54	40,943	951	287	168,247	3,950	674	589,021	15,768	18.25
1878	322	38 72	10,668	61	45,208	576	326	235,787	5,814	709	666,527	19,078	18.50
1879	319	41 94	8,235	30	21,994	1,570	279	186,040	3,960	628	634,628	13,634	17.75
1880	338	44 51	9,996	14	7,734	420	244	172,224	3,583	596	626,929	13,999	18.33
1881	382	50 32	11,009	21	10,729	170	254	151,488	3,474	658	670,614	14,780	19.08
1882	391	54 58	12,805	11	4,895	297	204	116,061	2,718	606	686,274	16,420	19.00
1883	380	46 38	10,859	10	4,115	106	160	87,020	1,985	550	558,866	12,714	18.25
1884	388	48 17	18,735	14	5,692	90	287	174,976	3,984	689	663,225	17,535	19.08
1885	395	49 10	14,622	13	5,058	116	251	163,321	3,416	658	668,989	18,163	20.75
1886	393	50 73	14,534	10	5,952	125	268	177,229	3,719	671	686,254	18,438	20.00
1887	430	54 85	15,127	8	3,736	135	231	180,139	2,800	669	674,006	17,987	20.49
1888	411	53 76	14,907	8	3,580	60	229	146,075	3,285	648	689,211	18,206	20.67
1889	409	56 53	15,547	12	8,563	111	309	215,865	4,530	730	783,691	20,281	20.79
1890	483	71 51	19,178	9	2,308	69	300	193,208	4,058	792	913,217	23,305	20.00
1891	484	71 85	19,014	15	4,778	123	326	238,123	4,790	832	962,228	20,927	20.00
1892	449	69 38	18,345	6	3,000	51	358	259,482	5,228	813	955,308	23,634	20.00
1893	445	66 45	18,970	7	3,761	89	330	255,682	4,796	775	923,480	21,948	23.12
1894	445	69 03	17,354	6	3,977	58	258	222,353	4,153	709	917,963	21,564	.....
1895	467	78 07	18,045	5	3,680	46	235	204,177	3,806	707	940,544	21,889	20.07
1896	421	69 77	17,502	7	4,884	59	269	253,754	4,368	697	956,215	21,919	22.50

CLEARED.

													Feet.
1878	466	398,068	13,749	26	20,102	699	234	1 44	3,194	755	857,819	17,492	17.50
1874	480	407,295	12,748	71	40,297	923	229	1 88	3,427	780	502,720	17,007	17 50
1875	519	234,831	9,376	72	39,011	804	195	1 86	2,924	586	452,238	13,404	17.50
1876	410	361,999	11,222	80	49,463	1,163	185	1 99	2,827	675	531,761	15,212	17.75
1877	400	439,370	13,981	65	44,829	1,066	161	1 42	2,489	626	5 41	15,736	18.25
1878	378	416,956	10,475	64	40,128	1,255	260	1 67	3,275	702	6 43	17,105	18.50
1879	365	442,734	8,534	99	24,891	497	229	1 70	3,129	694	6 95	13,480	17.75
1880	310	434,864	10,106	26	12,536	271	242	1 55	3,446	578	6 55	13,825	18.33
1881	369	508,433	11,456	22	13,662	253	261	1 79	3,745	652	7 53	15,454	19.00
1882	350	506,213	11,917	23	9,155	205	209	1 75	3,023	582	6 43	15,145	19.00
1883	355	415,720	9,780	10	4,115	90	165	1 00	2,015	530	5 25	11,885	18.25
1884	360	452,802	13,363	15	5,834	131	288	1 75	4,315	663	6 11	17,809	19.00
1885	414	503,773	14,672	20	6,723	143	228	1 58	3,844	662	6 58	18,184	20.17
1886	378	473,184	13,912	2	999	24	262	1 93	3,970	642	6 97	17,806	20.00
1887	380	480,030	14,167	4	978	28	269	2 56	4,189	653	6 64	18,283	20.00
1888	382	507,075	14,281	8	2,565	63	233	167,938	3,557	623	6 94	17,851	.....
1889	395	540,226	15,506	7	1,823	51	307	226,161	4,801	711	7 47	20,157	.....
1890	452	663,227	18,815	14	4,087	181	323	245,013	5,078	789	8 27	24,054	20.75
1891	445	676,900	18,200	4	2,909	208	339	271,067	5,429	788	8 78	23,837	20.75
1892	453	685,620	18,285	7	1,760	48	353	263,166	5,151	813	8 53	23,484	21.00
1893	411	622,391	16,190	9	4,050	75	338	282,690	5,524	749	9 61	21,714	21.75
1894	403	636,202	16,425	4	1,555	23	311	289,682	5,155	718	8 39	21,613	22.50
1895	412	643,303	16,642	3	718	21	297	302,534	5,230	711	8 56	21,893	23.02
1896	366	622,966	16,290	6	2,763	97	311	315,615	5,319	683	9 44	21,669	22.00

COMMERCE.

Year.	Value of exports.	Value of imports.	Duties collected.	Year.	Value of exports.	Value of imports.	Duties collected.
1877	$32,103,853	$36,307,906	$34,959.93	1887	$54,774,062	$52,650,223	$46,897.13
1878	40,028,968	42,948,485	23,304.85	1888	59,435,601	53,412,920	38,212.75
1879	40,901,421	42,064,473	27,778.73	1889	62,893,429	55,062,710	56,816.54
1880	47,836,411	45,522,480	78,456.41	1890	84,584,326	66,239,626	57,542.57
1881	58,965,901	48,716,900	356,550.22	1891	83,367,157	67,248,900	56,714.50
1882	52,004,248	45,952,105	61,148.70	1892	67,211,175	54,119,194	47,867.09
1883	53,915,934	47,600,796	65,245.34	1893 a	23,535,503	450,978	56,994.99
1884	46,425,513	49,112,316	48,147.28	1894 a	21,374,518	372,525	47,616.97
1885	48,313,216	49,313,219	45,161.40	1895 a	21,990,253	273,905	56,562.49
1886	51,033,180	51,118,824	35,455.53	1896 a	22,630,611	349,227	36,149.81

a Foreign only.

J. F. B. BECKWITH,
Collector of Customs.

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

N 2.

IMPROVEMENT OF SAVANNAH RIVER, GEORGIA.

The Savannah River is formed by the junction of the Tugaloo and Keowee, and flows in a southeastly direction to the sea.

A detailed description of the river is found in my report of the examination and survey of the portion above Augusta, printed as House Ex. Doc. No. 213, Fifty-first Congress, first session, and in my report of the survey of the river between Augusta and Savannah, dated June 30, 1890, and printed as Appendix O 2, Annual Report of the Chief of Engineers for 1890, pages 1328–1363.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steamboats drawing from 4 to 5 feet of water, but during the low-water season there are various shoals in the upper part of the river with low-water depths of not more than about 3 feet. The chief obstruction to navigation consists of sand and gravel bars, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The original plan for improving the Savannah River was submitted in 1880 and is given in Appendix J of the Annual Report of the Chief of Engineers for 1881.

The revised plan of improvement, as outlined in my report of June 30, 1890, provides for the establishment of a navigable steamboat channel 5 feet deep at ordinary summer low water between the cities of Augusta and Savannah.

This is to be accomplished by (1) removing sand and gravel bars; (2) regulating portions of the river, revetting caving banks, and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement as given in the project of 1890 is estimated, in round numbers, at $332,000, provided funds are regularly and adequately supplied.

From $3,000 to $5,000 will be required for the annual maintenance of the completed work.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

There were removed by the snag boat under the present project 2,357 snags and stumps, 14,442 overhanging trees, and 1 sunken flatboat; 1 tree was girdled and 169 logs were cut up on bank. There were dredged from the channel at Mother Peg Bar 2,022.45 cubic yards of material, and at Buggs Bar 1,762.69 cubic yards of material. At Canoe Cut Bar there were built 26 spur dams, contracting the channel to 450 feet and protecting the banks from erosion. In the construction of those dams there were driven 1,042 piles, and 2,780 linear feet of pile work was wattled; there were also driven 4 tie-piles and 4 clusters of fender piles, and there were put into the dams 4,212 square yards of brush mattresses, 1,430 cubic yards of brush fascines, and 248.5 cubic yards of stone. All of the foregoing work was done by hired labor and purchase of material in open market.

There were also built, under contract, 42 spur dams near Augusta. In that work and in repairing old spur dams there were used, under the new project, 12,093.44 cubic yards of brush fascines and 10,094.93 cubic yards of stone.

The total expenditures under the original project up to July 1, 1890, when the existing project was adopted, including all outstanding liabilities, were $93,480.09.

The total expenditures under the existing project up to July 1, 1896, including all outstanding liabilities, were $75,019.91.

For a special history of past work, see page 1029 of the Annual Report of the Chief of Engineers for 1880 and the annual reports of the same officer since that date.

CONDITION OF WORK JUNE 30, 1896.

The channel from Savannah to Augusta was in good navigable condition.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Operations by hired labor were commenced on September 5 and continued to November 28. During this period there were removed 1,615 snags and stumps and 987 overhanging trees; 59 logs were cut up on bank and 38 trees were girdled; 5 wrecks and 100 cubic yards of rock were removed, and 346 pounds of explosives was used.

CONDITION OF WORK JUNE 30, 1897.

The channel is in fair condition. A number of snags, however, has been lodged in it by the freshets and will be removed as soon as the river is low enough to permit of snagging operations.

COMMERCE AND NAVIGATION.

A detailed statement of the sources whence the commerce of this river is derived, of its value, and of the probable effects of the completion of the works of improvement, is given in my report of the survey of the river, dated June 30, 1890, and printed as part of Appendix O 2, Annual Report of the Chief of Engineers for 1890.

Prior to the inauguration of the works of improvement the commerce of the river, especially in the way of through shipments, was unimportant, as the condition of the channel rendered navigation uncertain and unsafe.

The improvement of the river has been accompanied by a steady increase in the volume of river traffic (especially in manufactured cotton goods from Augusta as through freight for exportation) and by a decrease of the rates of freight, both of which are more than commensurate with the expenditures involved. In fact, the annual commerce has increased at the rate of $10 for every dollar expended by the United States, and the freight rates have been reduced about 20 per cent.

The exports from the river valley are mainly cotton, naval stores, lumber, and wood, while the imports are fertilizers, camp and mill supplies, cotton ties and bagging, and manufactured articles. Three steamers are engaged in the river traffic, carrying annually about 40,000 tons of freight, valued at $4,000,000. In addition to the freights carried by the various steamers, the river valley affords logs, hewn and sawn timber, spars, and cord wood. The timber is rafted down the river. A large portion of the cord wood is rafted to Savannah, while the remainder is used as fuel by the river boats. The hard wood sawed and the staves and shingles split along the river are shipped to Savannah by boat. It is estimated that about 42,500 tons of logs, timber, and cord wood, valued at about $170,000, are annually rafted or lightered to Savannah and other places along the river. This makes the total annual shipments of the Savannah River 83,470 tons, valued at $4,160,000.

MISCELLANEOUS.

The work is located in the collection district of Savannah, Ga. Savannah is the nearest port of entry. Amount of duties collected in 1896, $36,149.81. Forts Oglethorpe and Pulaski are the nearest forts, and the nearest light-houses are those upon the river below Savannah.

The estimated cost of the improvement as given in the existing project assumes that funds will be adequately and regularly supplied for the economical prosecution of the work.

The project states that the sum of from $3,000 to $5,000 will be required annually for the maintenance of the completed work. Assuming a mean of those figures, there has been required for maintenance since the adoption of the existing project the sum of $28,000, leaving only $62,000 of the sum appropriated as available for the execution of the project of improvement. There is, hence, required for completion of the existing project the sum of $270,000.

It is proposed to expend any funds that may become available during the coming fiscal year in the removal of obstructions and in the construction of contracting works, according to the project of 1890.

The sum of $100,000 can be economically and advantageously expended during the coming year.

No permanent improvement can be expected, as new obstructions caused by logs and snags form during every freshet stage. They should, however, diminish in number from year to year.

The total expenditures under the present project up to June 30, 1897, including all outstanding liabilities, were $81,607.14.

Money statement.

July 1, 1896, balance unexpended	$15,000.00
July 30, 1897, amount expended during fiscal year	6,377.23
July 1, 1897, balance unexpended	8,622.77
July 1, 1897, outstanding liabilities	210.00
July 1, 1897, balance available	8,412.77
Amount (estimated) required for completion of existing project	270,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of the Savannah River, adopted in 1880, the following appropriations were made:

By act of Congress of—	
March 3, 1881	$15,000.00
August 2, 1882	25,000.00
July 5, 1884	15,000.00
August 5, 1886	15,000.00
August 11, 1888	21,000.00
	91,000.00
Unexpended balance from last appropriation carried to new project	19.91
Total	90,980.09
Received from other appropriations for use of snag boat	2,500.00
Aggregate	93,480.09

Since the existing project for improving the Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (balance unexpended)	$19.91
September 19, 1890	25,000.00
July 13, 1892	35,000.00
August 17, 1894	15,000.00
June 3, 1896	15,000.00
Total	90,019.91

N 3.

IMPROVEMENT OF SAVANNAH RIVER ABOVE AUGUSTA, GEORGIA.

The Savannah River is formed by the junction of the Tugaloo and Keowee rivers and flows in a southeasterly direction to the sea. Above the city of Augusta the river is navigable only by pole boats.

A detailed description of this river is given in my report of the preliminary examination and survey, printed as House Ex. Doc. No. 213, Fifty-first Congress, first session.

ORIGINAL CONDITION.

The Savannah River above the city of Augusta has a very steep slope, and the obstacles to navigation are not only very numerous and extensive but at places quite dangerous. They consist of rock ledges, isolated bowlders, and bars of sand and gravel, with minimum low-water depths of less than 1 foot.

PLAN OF IMPROVEMENT.

The original plan for improving the Savannah River above Augusta was submitted in 1879, and is given in Appendix I of the Annual Report of the Chief of Engineers for 1879.

The revised plan of improvement, as outlined in my report of January 31, 1890, provides for the establishment between Petersburg and the Locks of a downstream channel 12 to 25 feet in width and navigable during ordinary summer low water (or from nine to ten months of every year) for pole boats drawing 2 feet, and of an upstream channel navigable under the same conditions for pole boats drawing 1.3 feet of water. This is to be obtained by (1) removing logs and overhanging trees; (2) excavating rock, sand, or gravel, and with excavated materials raising crests of ledges; (3) constructing training walls to increase flow of water through sluices. The cost of improvement is estimated at $23,000, provided the money is all made available at once, or at $33,000 if supplied in smaller amounts.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Under the existing plan of improvement (since July 1, 1892) the following work has been done by hired labor and purchase of material in open market; there has been excavated 463 cubic yards of rock and there have been removed 16 snags and 140 overhanging trees. In repairing old dams and in constructing 2,445 linear feet of new ones there were used 3,250.39 square yards of brush mattresses, 325 cubic yards of brush fascines, and 1,772 cubic yards of riprap stone. During the same period the following work has been done by contract: In

repairing old dams and in constructing 1,210 linear feet of new ones there were used 2,018.66 cubic yards of fascines and 1,186.30 cubic yards of riprap stone. Besides this work 48 miles of river bank was cleared and 341.5 cubic yards of rock was excavated.

For a detailed history of past work see page 1032 of the Annual Report of the Chief of Engineers for 1888, and the annual reports of the same officer since that date.

The total expenditures under the original project up to July 1, 1890, when the existing project was adopted, including all outstanding liabilities, amounted to $39,000.

The total expenditures under the existing project up to July 1, 1896, including all outstanding liabilities, amounted to $15,544.52.

CONDITION OF WORK JUNE 30, 1896.

The channel was in fair navigable condition from the locks to Petersburg, a distance of 48 miles.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Operations by hired labor were commenced on October 26 and continued to October 31, and were confined to the Half Way Ledge. There were removed from the channel at this place 6 cubic yards of rock; 30 cubic yards of stone were used in repairing old dams.

CONDITION OF WORK JUNE 30, 1897.

The channel is in a fair condition. A number of snags, however, has been lodged in it by the freshets and will be removed as soon as the river is low enough to permit of snagging operations.

COMMERCE AND NAVIGATION.

A detailed statement of the commerce tributary to this river is given in my report on the examination and survey of the river, printed as House Ex. Doc. No. 213, Fifty-first Congress, first session.

The freight carried on the river consists principally of cotton, grain, fertilizers, and general merchandise. Its total value yearly amounts to about $30,000. With an improved pole-boat channel the commerce of the river could be considerably increased, but no work other than that necessary for the benefit of pole-boat navigation is needed.

MISCELLANEOUS.

The work is located in the collection district of Savannah, Ga. Savannah is the nearest port of entry. Amount of duties collected in 1896, $36,149.81. Forts Oglethorpe and Pulaski are the nearest forts, and the nearest light-houses are those upon the Savannah River below Savannah.

The total expenditures under the present project up to June 30, 1897, including all outstanding liabilities, were $15,770.91.

Money statement.

July 1, 1896, balance unexpended	$3,455.48
June 30, 1897, amount expended during fiscal year	226.39
July 1, 1897, balance unexpended	3,229.09
Amount (estimated) required for completion of existing project	14,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	14,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of Savannah River above Augusta, adopted in 1879, the following appropriations were made:

By act of Congress of—	
June 14, 1880	$16,000
March 3, 1881	8,000
August 2, 1882	15,000
Total	39,000

Since the existing project for improving this portion of Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—	
July 13, 1892	$10,000
August 17, 1894	6,000
June 3, 1896	3,000
Total	19,000

N 4.

IMPROVEMENT OF DARIEN HARBOR, GEORGIA.

About 12 miles above the town of Darien the Altamaha River divides into several branches. The northerly main branch forms the Darien River. That portion of Darien River between Darien and Doboy Sound is known as Darien Harbor.

Operations for improving this harbor have been carried on in accordance with a project of improvement submitted to the Chief of Engineers by General Gillmore, the officer then in charge, dated January 30, 1885, and printed as Appendix N 16, Annual Report of the Chief of Engineers for 1885.

ORIGINAL CONDITION.

Darien Harbor, in its original condition, was more or less obstructed at seven points by shoals, on which were found minimum mean low-water depths of from 6.4 to 10.6 feet. The shoals covered a total distance of 9.7 miles. The reaches between the shoals carried depths nowhere less than 12 feet at mean low water. The mean rise and fall of tide in the harbor is about 6.5 feet.

PLAN OF IMPROVEMENT.

The original plan of improvement submitted in 1885 and adopted in 1890 contemplates the establishment of a navigable channel between Darien and Doboy with a minimum mean low-water depth of 12 feet. This is to be accomplished by dredging to a minimum depth of 12.5 feet, and by the construction of wing dams at five of the shoals for maintaining the depth of the improved channel.

The estimated cost of the improvement is $170,000.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Between December 26, 1878, and April 24, 1879, there was dredged from the channel in Darien Harbor 51,041 cubic yards of material. The work was done in compliance with an act of Congress of 1878, and was not based upon any preliminary survey or project.

Work under the present project commenced in 1891. Since then there has been removed from the various shoals 86,640.20 cubic yards of material. There were constructed 24 wing dams, aggregating in length 5,585.6 feet; in this work there were used 1,434 piles, 286.66 square yards of brush mattresses, 25,276.74 cubic yards of brush fascines, 683 cubic yards of riprap stone, 77,941.25 feet B. M. of 6 by 10 inch timber, and 7,651 pounds of iron bolts. There were also driven 4 groups of tie piles and 52⅔ clusters of fender piles, making in all 1,600 piles put into the works.

Up to July 1, 1896, the total expenditures for the work under the existing project, including all outstanding liabilities, amounted to $75,000.

CONDITION OF WORK JUNE 30, 1896.

The works of construction were all in good condition, but some slight settlement had taken place. The channel depths had not diminished during the year, there being a minimum navigable depth at mean low water of 10.4 feet on all of the shoals in the harbor.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Dredging, under contract of September 25, 1896, with Rittenhouse R. Moore, was commenced on October 23, and continued until April 16, when work was stopped on account of exhaustion of funds. The following quantities of material were removed at the various points:

	Cubic yards.
1. Shoal No. 5	1,690
2. Brown John Shoal	5,330
3. Pico Cut, Shoal No. 4	5,259.3
4. North and South Reach, Shoal No. 3	27,902.30
5. Shoal No. 2	15,432.1
6. Shoal No. 1½	39,955.7
7. Shoal Center of Long Reach	21,574.4
Total	117,143.8

In all, therefore, 117,143.8 cubic yards of material were removed during the year. The cuts made by the dredges varied in width from 35 to 45 feet. In the following list the number of cuts and their aggregate length at each of the above points is given:

	Linear feet.
1. Shoal No. 5, 2 cuts, aggregating	1,035
2. Brown John Shoal, 4 cuts, aggregating	2,330
3. Pico Cut, Shoal No. 4, 4 cuts, aggregating	1,426
4. North and South Reach, Shoal No. 3, 4 cuts, aggregating	7,212
5. Shoal No. 2, 4 cuts, aggregating	4,310
6. Shoal No. 1½, 2 cuts, aggregating	10,055
7. Shoal Center of Long Reach, 2 cuts, aggregating	3,300

A detailed survey of all the shoals in the harbor was made in December and January. An examination of the channel across the various shoals was made in June.

CONDITION OF WORK JUNE 30, 1897.

The works of construction are all in good condition, but some settlement has taken place. The practicable channel depth is nowhere less than 11½ feet at mean low water, excepting at Shoal No. 1 (opposite Doboy), where no work was done and where the channel depth is only about 9½ feet.

COMMERCE AND NAVIGATION.

The commerce of Darien is mostly dependent upon water carriage. It consists principally of shipments of lumber, timber, naval stores, and rice, which are brought down the Altamaha River from the region bordering that river and its tributaries. But little cotton seeks an outlet at this port. The total annual trade amounts to about 125,000 tons, valued at $1,500,000, the freight on which is about $600,000.

The outlet of Darien Harbor is by way of Doboy and Doboy Bar, but the shoaling of the latter renders the entrance of deep-draft vessels impossible, and much of the timber that would otherwise be shipped from Darien is now rafted to Sapelo and St. Simons, at an increased cost of about 25 cents per 1,000 feet. These St. Simons shipments, amounting annually to about 4,000,000 feet, are not included in the Darien exports, although they pass through that harbor. There is also a large number of small sailing craft carrying rice, fish, vegetables, etc., plying on the inland waters around Darien and two steamers per week up the Altamaha River.

Money statement.

July 1, 1896, balance unexpended	$20,000.00
June 30, 1897, amount expended during fiscal year	19,883.59
July 1, 1897, balance unexpended	116.41
July 1, 1897, outstanding liabilities	116.41
Amount (estimated) required for completion of existing project	75,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	75,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

MISCELLANEOUS.

The work is situated in the collection district of Brunswick, Ga. Darien is the nearest port of entry. Amount of duties collected in Brunswick in 1896, $8,047.11; at Darien, $3,353.98. Sapelo Light is the nearest light-house, and Forts Oglethorpe and Pulaski are the nearest forts.

The total expenditures under the present project of improvement, up to June 30, 1897, including all outstanding liabilities, amounted to $95,000.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

The first appropriation (which was expended in dredging) was made by act of Congress of June 18, 1878, $8,000.

Under the existing project of improvement the following appropriations have been made for this work:

By act of Congress of—	
September 19, 1890	$25,000
July 13, 1892	25,000
August 17, 1894	25,000
June 3, 1896	20,000
Total	95,000

Abstract of bids opened at Savannah, Ga., September 8, 1896, by Capt. O. M. Carter, Corps of Engineers, for dredging in Darien Harbor, Brunswick Harbor, and inside water route between Savannah and Fernandina.

No.	Name and address of bidder.	Dredging in Darien Harbor, Georgia (75,000 cubic yards).		Dredging in Brunswick Harbor, Georgia (60,000 cubic yards).		Dredging along inside water route (75,000 cubic yards).		Total.
		Price.	Amount.	Price.	Amount.	Price.	Amount.	
1	Savannah Dredging Co., Jacob Paulsen, president, Savannah, Ga.	$0.14	$10,500	$0.16	$9,600	$0.13½	$10,125	$30,225
2	Rittenhouse R. Moore, Mobile, Ala. *a*	.12	9,000	.14	8,400	.10	7,500	24,900
3	American Dredging Co., S. Y. Schermerhorn, president, Philadelphia, Pa. *b*	.17	12,750	.18	10,800	.16	12,000	35,550
4	P. Sanford Ross, Jersey City, N. J.	.15	11,250	.16	9,600	.14	10,500	31,350
5	Virginia Dredging Co, J. Clement Shafer, president, Richmond, Va. *c*	.17 9/16	13,425	.17 9/16	10,740	.17 9/16	13,425	37,590

a Bid recommended for acceptance, he being the lowest responsible bidder for the best and most suitable materials and services.
b Evidence of authority to bid not filed.
c Certificate to guaranty omitted.
Amount available, $45,000.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels at Darien, Ga., from January 1, 1875, to December 31, 1896.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
													Feet.
1875	77	28,053	647	....	.....	.....	92	47,600	1,198	169	75,653	1,845	22
1876	65	23,105	611	....	.....	.....	124	70,368	1,897	189	93,473	2,508	21
1877	104	24,827	1,257	3	674	22	99	50,913	1,231	206	106,414	2,510	20
1878	61	29,264	641	2	1,051	20	126	60,109	1,628	189	90,424	2,289	20
1879	58	23,275	487	3	4,199	25	115	57,710	1,407	176	82,184	1,919	19½
1880	66	21,539	489	1	688	13	134	68,072	1,608	201	90,270	2,140	19½
1881	101	40,619	849	3	1,220	29	162	84,457	1,991	166	126,295	2,869	19½
1882	117	48,208	999	1	455	9	90	51,421	1,155	208	100,082	2,163	19
1883	95	38,173	815	....	.....	.....	93	49,290	1,135	188	87,963	1,950	19
1884	81	34,412	714	2	606	16	92	50,178	1,133	175	85,193	1,863	19
1885	78	27,763	691	2	652	16	80	42,587	975	160	71,002	1,673	18½
1886	108	44,389	852	....	.....	.....	42	20,772	483	150	65,161	1,335	19
1887	127	57,035	1,059	5	2,349	45	26	13,023	298	158	72,407	1,402	.....
1888	185	76,645	1,558	1	402	9	22	13,423	273	208	91,470	1,840	18½
1889	145	69,763	1,341	7	4,349	62	61	19,837	453	213	93,949	1,856	13½
1890	169	58,058	1,158	5	1,964	41	28	10,860	308	202	70,222	1,507	18½
1891	137	56,818	1,124	6	2,377	46	24	17,853	308	167	77,048	1,478	.....
1892	168	69,627	1,369	1	353	7	25	17,446	334	194	87,426	1,710	18½
1893	134	58,310	1,076	4	1,918	33	33	31,417	486	171	91,640	1,595	18½
1894	81	39,158	653	3	1,215	23	58	52,751	852	142	95,124	1,528	17
1895	131	65,317	1,121	3	1,228	23	46	44,213	702	180	110,668	1,846	17
1896	92	42,024	717	1	342	8	55	53,499	876	148	95,523	1,591	.....

Arrivals and clearances of vessels at Darien, Ga., etc.—Continued.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American Vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
													Feet.
1875	22	12,214	328	11	4,055	97	104	55,759	1,372	137	72,028	1,797	22
1876	39	9,300	270	4	1,553	32	180	87,489	2,263	223	98,342	2,565	21
1877	44	13,209	314	4	842	21	169	92,795	2,154	217	106,846	2,489	20
1878	28	7,842	181	6	3,000	62	149	83,385	1,947	183	94,236	2,190	20
1879	40	14,052	301	7	2,765	57	125	65,433	1,538	172	82,250	1,896	19½
1880	55	17,076	393	7	3,589	72	168	84,172	2,016	230	194,837	2,481	19½
1881	80	28,492	617	8	3,120	70	184	95,353	2,164	272	126,965	2,851	19½
1882	93	34,098	709	6	1,962	46	115	63,525	1,434	214	99,585	2,189	19
1883	66	25,019	510	9	3,533	72	108	56,411	1,340	183	84,963	1,931	19
1884	59	20,637	457	11	3,977	85	119	66,337	1,478	189	90,951	2,020	19
1885	46	16,649	339	8	3,354	62	98	52,742	1,198	152	72,745	1,599	18½
1886	93	38,295	719	10	3,682	80	50	24,376	564	153	66,358	1,363	19
1887	126	55,592	1,016	12	1,144	17	16	8,612	189	144	65,700	1,222	.....
1888	155	64,749	1,318	2	538	15	36	23,742	453	193	89,029	1,786	19
1889	155	63,347	2,091	6	4,333	66	46	26,488	528	207	94,168	2,685	.....
1890	171	58,810	1,174	3	962	23	31	15,569	336	205	75,351	1,533	.....
1891	127	53,890	1,031	3	896	20	26	18,006	256	156	72,792	379	.....
1892	161	69,488	1,310	2	917	16	33	21,502	418	196	91,807	1,744	.....
1893	137	56,297	1,115	1	300	6	46	40,150	630	184	96,747	1,751	.....
1894	75	33,478	583	1	479	8	61	57,772	894	137	91,689	1,485	17
1895	124	55,829	970	1	817	16	53	51,599	818	178	108,245	1,804	17
1896	93	41,900	705	....	.....	.....	62	59,594	926	155	101,494	1,631	.....

Timber shipments from port of Darien, Ga., from January 1, 1875, to December 31, 1896.

Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	Value.
1875	41,447,024	$557,524	10,992,600	$181,377	52,439,624	$738,901
1876	60,762,000	735,099	8,370,000	138,105	69,132,000	873,204
1877	64,378,000	776,856	11,888,100	196,153	76,266,100	973,010
1878	59,697,124	716,365	7,057,800	116,454	66,754,924	832,819
1879	47,217,818	566,613	12,646,800	208,672	59,804,618	775,285
1880	74,612,520	895,350	15,368,500	253,579	89,981,020	1,148,929
1881	65,420,876	785,050	25,642,800	423,106	91,063,676	1,208,156
1882	36,639,379	439,672	30,688,200	506,355	67,327,579	946,037
1883	42,385,000	508,620	22,517,100	371,532	64,902,100	880,152
1884	50,656,000	607,872	18,573,300	306,459	69,229,300	914,331
1885	40,101,000	501,262	14,984,100	247,938	55,085,100	749,200
1886	19,960,000	219,500	24,465,000	661,440	54,425,000	870,940
1887	12,023,611	138,476	50,349,600	912,220	62,373,211	1,056,960
1888	17,975,371	215,705	65,998,200	1,121,960	83,975,571	1,337,665
1889	20,772,265	237,652	50,667,660	760,144	71,449,865	997,816
1890	10,962,017	140,746	68,223,683	949,762	79,185,700	1,090,508
1891	13,785,333	274,674	45,519,707	910,718	59,305,040	1,185,392
1892	12,893,730	179,616	49,708,879	1,093,595	62,602,609	1,273,211
1893	33,300,000	399,600	41,375,100	827,502	74,675,100	1,227,102
1894	47,910,319	583,671	30,094,750	571,789	78,004,519	1,155,460
1895	39,602,963	426,451	44,660,000	803,880	84,262,963	1,228,331
1896	43,059,139	461,148	34,150,251	341,502	77,209,390	802,650

Commerce.

Year.	Value of exports.	Value of imports.	Total collections.
1880	$1,621,904	$5,600	$11,806.72
1881	1,137,490	3,356	18,980.02
1882	1,073,008	1,025	11,254.19
1883	969,834	2,334	11,067.87
1884	1,038,185	11	9,688.20
1885	860,500	.....	2,359.01
1886	1,037,330	.....	1,716.46
1887	1,221,000	.....	1,060.97
1888	2,100,000	2,600	964.13
1889	997,816	.....	1,784.03
1890	140,746	.....	968.95
1891	1,530,000	.....	1,198.28
1892	1,452,827	.....	1,500.85
1893	1,406,718	.....	1,930.21
1894	804,972	.....	3,516.70
1895	1,228,000	.....	2,631.24
1896	802,651	.....	3,353.98

R. W. GRUBB,
Deputy Collector, Darien, Ga.

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

N 5.

IMPROVEMENT OF ALTAMAHA RIVER, GEORGIA.

The Altamaha River is formed by the junction of the Oconee and Ocmulgee rivers in the southeastern part of Georgia, and flows in a southeasterly direction to the sea.

A detailed description of this river is given in my report of a survey, dated June 12, 1890, which is printed as part of Appendix O, Annual Report of the Chief of Engineers for 1890, pages 1327–1386.

ORIGINAL CONDITION.

The chief obstruction to the navigation of the Altamaha River consists in rock ledges, sand bars, overhanging trees, snags, and sunken logs. The rock ledges were confined to the upper portion of the stream, while the other obstructions were found throughout its entire course. The low-water depths at some points did not exceed 1 foot.

PLAN OF IMPROVEMENT.

The original plan for improving the Altamaha River was submitted in 1880, and is given in Appendix J of the Annual Report of the Chief of Engineers for 1881.

The revised plan of improvement, outlined in my report of June 12, 1890, provides for the establishment of a navigable steamboat channel, 3 feet deep at ordinary summer low water, between the junction of the Oconee and Ocmulgee rivers and the town of Darien.

This is to be accomplished by (1) removing rock shoals and sand bars; (2) building deflecting dikes and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream; (4) revetting caving banks.

The cost of the improvement, as given in the project of 1890, is estimated in round numbers at $129,000, provided funds are regularly and adequately supplied.

From $3,000 to $5,000 will be required for the annual maintenance of the completed work.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

There were removed by the snag boat, under the present project of improvement (since June 30, 1890), 1,083 snags and stumps, 7,324 overhanging trees, 31 logs, 45 cubic yards of rock, and the wreck of the steamer *Tar Heel.*

In constructing wattled pile spur dams, bank protection, and training walls, and in repairing old work at Sand Bar, Beards Bluff, and Marrowbone Bar, there were driven 482 piles for pile work and 66 fender piles; 3,246 linear feet of piling was wattled with poles, 4,127 square yards of brush mattresses was sunk and covered with 376 cubic yards of riprap stone. All this work was done by hired labor and purchase of material in open market.

In 1893 the construction of a training wall and spur dams was begun at Coupers Bar. Work was continued intermittently until the funds available were exhausted. There have been used in this work 242.14 cubic yards of riprap stone, 7,394.83 cubic yards of brush fascines, 699 piles, 17,487.25 feet B. M. of 6 by 10 inch timber, and 1,916.53 pounds of iron bolts. All of this work was done by contract.

The total expenditures under the original project up to July 1, 1890, when the existing project was adopted, including all outstanding liabilities, amounted to $64,776.59.

The total expenditures under the existing project up to July 1, 1896, including all outstanding liabilities, amounted to $40,223.41.

For a detailed history of early work, see page 1246 of the Annual Report of the Chief of Engineers for 1889, and the annual reports of the same officer since that date.

CONDITION OF WORK JUNE 30, 1896.

The works of improvement were in good order. So far as is known, no changes in the river channel had taken place since June 30, 1895, at which time the depth at Beards Bluff was 4½ feet and at Marrowbone Bar 5 feet, both at summer low water.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Operations by hired labor were commenced November 5 and continued until December 12. During this period there were removed 85 snags and stumps, 153 overhanging trees, and 2½ cubic yards of rock; 78 trees were girdled and 19 logs were cut up on bank.

CONDITION OF WORK JUNE 30, 1897.

The works of improvement are in good order. The channel is in fair condition; a number of snags, however, has been lodged in it by the freshets and will be removed as soon as the river is sufficiently low to permit of snagging operations. At Coupers Bar the channel has deepened to 2.3 feet along the training wall.

COMMERCE AND NAVIGATION.

The commerce passing over the Altamaha River is derived not only from the region bordering it, but also from the country bordering its tributaries, the Ocmulgee and the Oconee rivers.

About one-half of the counties bordering the Altamaha River are wholly dependent upon the river for transportation, while the remainder are served in part by two railroads, the East Tennessee, Virginia and Georgia, running approximately parallel to the river on its southern

side at an average distance of about 15 miles from it, and the Savannah, Florida and Western, crossing the river at Doctortown at about right angles to its general direction. The territory dependent upon the river for the transportation of its produce and supplies is composed of one-third of the counties of Appling, Wayne, Glynn, and all of Tatnall and McIntosh.

The commerce of the river during the past twelve months is estimated at 332,000 tons, valued at $4,000,000.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1896, $8,047.11. Sapelo Light is the nearest light-house, and Forts Oglethorpe and Pulaski are the nearest forts.

The total expenditures under the present project to June 30, 1897, including all outstanding liabilities, were $44,474.73.

The estimated cost of the improvement as given in the existing project assumes that funds will be adequately and regularly supplied for the economical prosecution of the work. This has not been done. The project states that the sum of from $3,000 to $5,000 will be required annually for the maintenance of the completed work. Assuming a mean of these figures, there has been required for maintenance since the adoption of the present project the sum of $28,000, leaving only $22,000 of the sum appropriated as available for the execution of the project of improvement. Hence there is required for completion of the existing project the sum of $107,000.

It is proposed to expend any funds that may become available during the coming fiscal year in the removal of obstructions and the improvement of the shoal places in the river according to the project of 1890.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be effected, as new obstructions, caused by logs and snags, form during every freshet stage. They should, however, diminish in number from year to year.

Money statement.

July 1, 1896, balance unexpended	$10,000.00
June 30, 1897, amount expended during fiscal year	4,251.32
July 1, 1897, balance unexpended	5,748.68
Amount (estimated) required for completion of existing project	107,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	50,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of the Altamaha River, adopted in 1880, the following appropriations were made:

By act of Congress of—	
March 3, 1881	$5,000.00
August 2, 1882	15,000.00
July 5, 1884	20,000.00
August 5, 1886	20,000.00
August 11, 1888	10,000.00
	70,000.00
Unexpended balance of last appropriation carried to new project	223.41
Total	69,776.59

Since the existing project for improving Altamaha River was adopted in 1890 the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$223.41
September 19, 1890	15,000.00
July 13, 1892	15,000.00
August 17, 1894	10,000.00
June 3, 1896	10,000.00
Total	50,223.41

N 6.

IMPROVEMENT OF OCONEE RIVER, GEORGIA.

The Oconee River rises in the northeastern part of Georgia, flows in a southeasterly direction, and unites with the Ocmulgee to form the Altamaha. A detailed description of this river is given in my report of the preliminary examination and survey, printed as House Ex. Doc. No. 211, Fifty-first Congress, first session.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steamboats drawing from 3 to 4 feet, but during the low-water season there are various shoals with low-water depths of not more than 2 feet. The chief obstructions to navigation consist of sand bars, rock shoals, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The original plan for improving the Oconee River was submitted in 1875 and is given in the Annual Report of the Chief of Engineers for that year. That plan was modified in 1878, 1880, and 1888.

The present plan of improvement, outlined in my report of February 5, 1890, provides for the establishment of a navigable steamboat channel 3 feet deep at ordinary summer low water from Milledgeville to the river's mouth.

This is to be accomplished by (1) removing rafts, rock shoals, and sand bars; (2) enlarging portions of the river, revetting caving banks, and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement is estimated at $171,000, provided funds are regularly and adequately supplied.

From $1,000 to $5,000 will be required for the annual maintenance of the completed work.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Under the existing plan of improvement (since July 1, 1890) the following work has been done by the snag boat: There have been removed 12,343 snags and stumps, 27,839 overhanging trees, 366.5 cords of drift wood, 103 cubic yards of rock and stone, and 266.67 cubic yards of clay and gravel; 900 logs were cut up on bank, 252 trees were girdled, and 600 cubic yards of rock quarried and put in a dam at Fish Trap Cut.

In constructing and repairing 8 spur dams of 935 feet of aggregate length at Old Boat Yard there were driven 176 piles; 1,015 linear feet of piling was wattled, 1,011 linear feet of brush mattresses 18 feet wide was sunk and covered with stone, and the banks at the ends of the dams were protected with brush and stone.

All of this work was done by hired labor, and purchase of materials in open market.

The total expenditures under the original project up to July 1, 1890, when the existing project was adopted, including all outstanding liabilities, amounted to $44,822.18.

The total expenditures under the existing project up to July 1, 1896, including all outstanding liabilities, amounted to $60,201.43.

For a detailed history of past work see page 1253 of the Annual Report of the Chief of Engineers for 1889 and the annual reports of the same officer since that date.

CONDITION OF WORK JUNE 30, 1896.

The jetties at Old Boat Yard were in good condition. A fairly good channel was maintained from the mouth to Milledgeville, and the channel through the rocky shoals below Dublin had been deepened and widened.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Operations by hired labor were commenced on October 29, but had to be suspended at the end of that month on account of a sudden rise in the river. Operations were resumed on January 28 and continued until February 20, the river being somewhat higher than a good working stage. There were removed during this period 75 snags and stumps, 187 overhanging trees, and 100 cubic yards of rock; 50 logs were cut up on bank.

CONDITION OF WORK JUNE 30, 1897.

The channel was left in good condition when work was stopped. A number of snags, however, has since then been lodged in it by the freshets. They will be removed as soon as the river is sufficiently low to permit of snagging operations.

COMMERCE AND NAVIGATION.

The Oconee River is navigable from the mouth to Milledgeville, a distance of 147 miles. During the past year the boats plying the river carried about 27,000 tons of freight, valued at about $1,240,000. The freights consist of rosin, turpentine, cotton, staves, guano, corn, cotton seed, and general merchandise. In addition to the freights carried by the steamers there was about 88,000 tons of timber drifted down the river, valued at about $440,000. The total commerce of the river during the last year was 115,000 tons, valued at $1,680,000.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1896, $8,047.11. Sapelo Light is the nearest light-house, and Forts Oglethorpe and Pulaski are the nearest forts.

Of the unexpended balance of $201.18 from the appropriation of August 11, 1888, there was required for obligations contracted under

the former project of improvement the sum of $23.36, leaving an available balance of $177.82 for expenditures under the existing project of improvement.

The total expenditures under the present project to June 30, 1897, including all outstanding liabilities, were $64,830.01.

The estimated cost of the improvement given in the *existing project* assumes that funds will be adequately and regularly supplied for the economical prosecution of the work. This has not been done. The project states that the sum of from $1,000 to $5,000 will be required annually for the maintenance of the completed work. Assuming a mean of those figures, there has been required for maintenance since the adoption of the existing project the sum of $21,000, leaving only $49,000 of the sum appropriated as available for the execution of the project of improvement. There is, however, required for completion of the existing project the sum of $122,000. It is proposed to expend any funds that may become available during the coming fiscal year in the removal of obstructions and the improvement of the shoal places in the river, according to the project of 1890.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be expected, as new obstructions, caused by logs and snags, form during every freshet stage. They should, however, diminish in number from year to year.

Money statement.

July 1, 1896, balance unexpended	$10,000.00
June 30, 1897, amount expended during fiscal year	4,628.58
July 1, 1897, balance unexpended	5,371.42
Amount (estimated) required for completion of existing project	122,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	50,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the works of improvement were begun the following appropriations have been made:

By act of Congress of—		By act of Congress of—	
June 18, 1878	$10,000.00	July 5, 1884	$3,000.00
March 3, 1879	1,500.00	August 5, 1886	9,000.00
June 14, 1880	1,500.00	August 11, 1888	12,500.00
March 3, 1881	2,500.00		45,000.00
August 2, 1882	5,000.00		
Unexpended balance from last appropriation carried to new project			201.18
Total			44,798.82

Since the existing project for improving the Oconee River was adopted the following appropriations have been made for this work:

By act of Congress of—		By act of Congress of—	
August 11, 1888 (unexpended balance)	$201.18	August 17, 1894	$10,000.00
September 19, 1890	25,000.00	June 3, 1896	10,000.00
July 13, 1892	25,000.00	Total	70,201.18

N 7.

IMPROVEMENT OF OCMULGEE RIVER, GEORGIA.

The Ocmulgee River is formed by the junction of the South and Yellow rivers, about 20 miles below Covington; and flows thence in a southeasterly direction, about 250 miles, where it unites with the Oconee to form the Altamaha. A detailed description of this river is found in my report of the preliminary examination and survey, printed as House Ex. Doc. No. 215, Fifty-first Congress, first session.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steamboats drawing from 3 to 4 feet, but during the low-water season there are various shoals with depths of not more than 2 feet. The chief obstructions to navigation consists of rock shoals, sand bars, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The original plan for improving Ocmulgee River was submitted in 1876, and is given in the Annual Report of the Chief of Engineers for that year. That project was revised in 1882 and again in 1886.

The present plan of improvement, outlined in my report of February 5, 1890, provides for the establishment of a navigable steamboat channel 3 feet deep at ordinary summer low water from Macon to the river's mouth.

This is to be obtained by (1) removing rock shoals and sand bars; (2) closing incipient cut-offs and revetting caving banks; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement, as given in the project of 1890, is estimated at $210,000, provided funds are regularly and adequately supplied.

From $1,000 to $5,000 will be required for the annual maintenance of the completed work.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Under the present project of improvement (since July 1, 1890) there have been removed by the snag boat and bank parties 8,069 snags and stumps, 28,252 overhanging trees, 1,216 cubic yards of solid rock and loose bowlders, and the wrecks of 4 steamboats; 1,192 trees were girdled and 351 logs were cut up on bank. At Tillmans Bar 12 spur dams and 278 linear feet of crib bank protection were built; 2 snag dams were built at Ashley Landing and 1 snag dam at Indian Timber Landing. All work was done by hired labor and purchase of material in open market.

The total expenditures under the original project up to July 1, 1890, when the existing project was adopted, including all outstanding liabilities, amounted to $79,390.73.

The total expenditures under the existing project up to July 1, 1896, including all outstanding liabilities, amounted to $65,244.95.

For a detailed history of past work see page 1258 of the Annual Report of the Chief of Engineers for 1889 and the annual reports of the same officer since that date.

CONDITION OF WORK JUNE 30, 1896.

The channel from the mouth to Macon was maintained in good condition.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Operations by hired labor were commenced on September 16 and continued until November 9, when they had to be suspended on account of the high stage of the river. Operations were resumed on December 13 and continued until January 27. There were removed during this time 205 snags and stumps, 1,218 overhanging trees, and 548 cubic yards of rock; 1 tree was girdled and 43 logs were cut up on bank.

CONDITION OF WORK JUNE 30, 1897.

The channel was left in good condition when work was stopped; a number of snags, however, have since then been lodged in it by the freshets. They will be removed as soon as the river is sufficiently low to permit of snagging operations.

COMMERCE AND NAVIGATION.

The boats plying the Ocmulgee River carried during the last fiscal year about 27,400 tons of freight, valued at somewhat more than $1,650,000. The freights consisted mainly of rosin, spirits of turpentine, fertilizers, corn, and merchandise. In addition to this it is estimated there was rafted 96,500 tons of timber, valued at $386,000. The total commerce of the river during the fiscal year just closed was, therefore, 121,900 tons, valued at $2,038,400.

A full and carefully prepared statement of the conditions and circumstances that will affect this commerce when the river is placed in a thoroughly navigable condition from its mouth to the city of Macon is contained in Mr. J. L. Van Ornum's report on the survey of the Ocmulgee River accompanying my report of February 5, 1890, and printed as part of Appendix O 12, Report of the Chief of Engineers for 1890, to which I respectfully refer. It is impossible to make an accurate estimate of the increased commerce that will follow such improvement.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1896, $8,047.11. Sapelo Light is the nearest light-house, and Forts Oglethorpe and Pulaski are the nearest forts.

Of the unexpended balance of $224.95 from the appropriation of August 11, 1888, there was required for obligations contracted under the former project of improvement the sum of $135.68, leaving an available balance of 109.27 for expenditures under the existing project of improvement.

The total expenditures under the existing project to June 30, 1897, including all outstanding liabilities, amounted to $70,720.19.

The estimated cost of the improvement, as given in the existing project, assumes that funds will be adequately and regularly supplied for the economical prosecution of the work. This has not been done. The project states that the sum of from $1,000 to $5,000 will be required annually for the maintenance of the completed work. Assuming a mean of those figures, there has been required for maintenance since

the adoption of the existing project the sum of $21,000, leaving only $54,000 of the sum appropriated as available for the execution of the project of improvement. There is hence required for the completion of the existing project the sum of $156,000. It is proposed to expend any funds that may become available during the present fiscal year in the removal of obstructions and in the improvement of the shoals in the river between Macon and the river's mouth, according to the project of 1890.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be effected, as new obstructions, caused by logs and snags, form during every freshet stage. They should, however, diminish in number from year to year.

Money statement.

July 1, 1896, balance unexpended	$10,000.00
June 30, 1897, amount expended during fiscal year	5,475.24
July 1, 1897, balance unexpended	4,524.76
Amount (estimated) required for completion of existing project	156,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	50,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of the Ocmulgee River, adopted in 1876, the following appropriations were made:

By act of Congress of—		By act of Congress of—	
August 14, 1876	$15,000.00	July 5, 1884	$3,000.00
June 18, 1878	15,000.00	August 5, 1886	7,500.00
March 3, 1879	7,000.00	August 11, 1888	15,000.00
June 14, 1880	7,000.00		79,500.00
March 3, 1881	5,000.00		
August 2, 1882	5,000.00		
Unexpended balance carried forward from last appropriation to new project			224.95
Total			79,275.05

Since the existing project for improving Ocmulgee River was adopted the following appropriations have been made for the work:

By act of Congress of—		By act of Congress of—	
August 11, 1888 (unexpended balance)	$224.95	August 17, 1894	$10,000.00
September 19, 1890	30,000.00	June 3, 1896	10,000.00
July 13, 1892	25,000.00	Total	75,241.95

N 8.

IMPROVEMENT OF BRUNSWICK HARBOR, GEORGIA.

About 2 miles above the city of Brunswick Turtle River is divided by Buzzard Island into two branches, the smaller one, flowing to the eastward of the island and upon which the city of Brunswick is situated, being known as East River, the other retaining the name of Turtle River. These streams unite again about 1½ miles below the city to

form Brunswick River. The lower part of East River forms what is known as the harbor of Brunswick. Operations for the improvement of this harbor have been carried on in accordance with a project of improvement prepared by General Gillmore, the officer then in charge, and printed as Appendix M 12, Annual Report of the Chief of Engineers for 1886. This project is an enlargement and a *modification* of a previous one submitted by the same officer and *printed* as Appendix J 7, Annual Report of the Chief of Engineers *for* 1880.

ORIGINAL CONDITION.

Turtle and Brunswick rivers have low-water depths of from 4 to 6 fathoms. Over the shoal in East River in front of the city there was, when the existing project of improvement was adopted, a low-water depth of only 1½ fathoms. The mean rise and fall of tide is about 6.6 feet.

PLAN OF IMPROVEMENT.

The following comprise the main features of the plan of improvement:

(1) A training wall projecting from the most easterly point of Buzzard Island and located approximately parallel to and 1,000 feet or less distant from the opposite shore of East River.

(2) A low dam across Turtle River extending obliquely upstream from the upper end of Buzzard Island to the opposite shore of Blythe Island.

(3) Short spur jetties in the lower part of East River.

(4) Dredging in the vicinity of Turtle River Dam and on the shoal in the lower part of East River.

The training walls and spurs were to be constructed of palmetto cribs loaded with stone or of successive courses of log and brush mattresses loaded with riprap stone. The works were intended to establish and maintain a 15-foot low-water channel across the shoal in East River. The cost of the original project was estimated at $73,187.50, and as modified at $190,000.

In 1836 an appropriation of $10,000 was made for the removal of the shoal in East River. Since the adoption of the modified project nine appropriations have been made by Congress for the work, aggregating $190,000. Two additional appropriations of $10,000 each were made for maintenance, one in 1894 and the other in 1896.

In my report of November 26, 1894, concerning a revision of the project of improving harbor at Brunswick, I stated that—

> It will be more economical and advantageous to maintain the desired depth of 15 feet at mean low water by keeping the training wall in good condition and by annual dredging than by constructing a dam across Turtle River and further channel contraction.

I also estimated the cost of maintenance at $15,000 per annum, provided that sum be made available each year.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

A summary of operations prior to July 1, 1895, is given in my report for 1896 (Report of the Chief of Engineers for 1896, p. 1274). No work was done during the fiscal year 1896.

CONDITION OF WORK JUNE 30, 1896.

The training wall was in good condition, although some settlement had taken place. As far as known the channel was in good condition.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

Dredging under contract of September 25, 1896, with Rittenhouse R. Moore, was commenced on April 20 and continued until the end of the fiscal year.

There were removed from the channel in front of the city 14,571.3 cubic yards of material and in Academy Creek 45,111.9 cubic yards of material, making a total of 59,683.2 cubic yards of material removed during the fiscal year.

Examinations of the channel were made in January and June.

CONDITION OF WORK JUNE 30, 1897.

The training wall is in good condition, although some settlement has taken place. There is a practicable channel depth of 15 feet at mean low water along the city front in East River and in Academy Creek.

COMMERCE AND NAVIGATION.

Previous to the year 1871 the city of Brunswick was of slight commercial importance, the value of the exports for that year being less than $500,000. In 1875 the value of the total exports had increased to $639,000. From that year up to the present, and especially since 1880, the importance of the city of Brunswick has increased with remarkable rapidity.

In 1880 the population of Brunswick was 2,981; by 1893 it had increased to more than 12,000. Taxable property increased in value from $1,300,000 in 1880 to $6,000,000 in 1890. The naval-stores business did not begin here until 1875; in 1892 there was a yearly business of more than $1,000,000, and in 1894 Brunswick was the second naval-stores port in the world. During the same period the lumber business shows an enormous increase. The supply of yellow-pine timber is within easy reach of this port and is practically inexhaustible. White oak, ash, cypress, hard woods, American mahogany, and live oak are accessible within short distances, and all other classes of hard woods are obtainable in unlimited quantities from Alabama, Tennessee, and north Georgia. In 1880 there was shipped from this port 37,000,000 feet of lumber; in 1892 the shipments of lumber amounted to 213,172,000 feet, valued at $2,349,468, besides 1,054,077 railroad ties, valued at $472,772. Lumber was at one time the chief export of Brunswick, but cotton now holds that place. The exports of this staple during the season of 1884–85 amounted to 4,000 bales. Since then the exports of this article have increased wonderfully, and in 1896 the shipments amounted to 153,787 bales.

Besides a line of steamers to New York and several lines to points in Georgia and Florida, a large fleet of foreign and coastwise steam and sailing vessels is engaged in the Brunswick trade, which consists principally of shipments of cotton, naval stores, lumber, ties, and phosphates.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1896, $8,047.11. St. Simons Light is the nearest light-house, and Fort Clinch, Fla., the nearest fort.

The sum of $15,000 can be economically and advantageously expended during the coming fiscal year in maintaining the present channel depths by dredging.

The total expenditures to June 30, 1897, including all outstanding liabilities, amounted to $212,322.16, of which $22,322.16 was for maintenance.

Money statement.

July 1, 1896, balance unexpended		$15,000.00
June 30, 1897, amount expended during fiscal year		8,268.34
July 1, 1897, balance unexpended		6,731.66
July 1, 1897, outstanding liabilities	$4,053.82	
July 1, 1897, amount covered by uncompleted contracts	1,590.12	
		5,643.94
July 1, 1897, balance available		1,087.72
Amount that can be profitably expended in fiscal year ending June 30, 1899, for maintenance		15,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the work of improvement was begun the following appropriations have been made:

By act of Congress of—		By act of Congress of—	
March 3, 1879	$20,000	August 11, 1888	$35,000
June 14, 1880	10,000	September 19, 1890	35,000
March 3, 1881	5,000	July 13, 1892	27,500
August 2, 1882	25,000		
July 5, 1884	10,000	Total	190,000
August 5, 1886	22,500		

For maintenance:	
August 17, 1894	10,000
June 3, 1896	15,000
Aggregate	215,000

Abstract of bids opened at Savannah, Ga., September 8, 1896, by Capt. O. M. Carter, Corps of Engineers, for dredging in Darien Harbor, Brunswick Harbor, and Inside Water Route, between Savannah and Fernandina.

No.	Name and address of bidder.	Dredging in Darien Harbor, Georgia (75,000 cubic yards).		Dredging in Brunswick Harbor, Georgia (60,000 cubic yards).		Dredging along Inside Water Route (75,000 cubic yards).		Total.
		Price.	Amount.	Price.	Amount.	Price.	Amount.	
1	Savannah Dredging Co., Jacob Paulsen, president, Savannah, Ga.	$0.14	$10,500	$0.16	$9,600	$0.13½	$10,125	$30,225
2	Rittenhouse R. Moore, Mobile, Ala. *a*	.12	9,000	.14	8,400	.10	7,500	24,900
3	American Dredging Co., S. Y. Schermerhorn, president, Philadelphia, Pa. *b*	.17	12,750	.18	10,800	.16	12,000	35,550
4	P. Sanford Ross, Jersey City, N. J.	.15	11,250	.16	9,600	.14	10,500	31,350
5	Virginia Dredging Co., J. Clement Shafer, president, Richmond, Va. *c*	.17 9/10	13,425	.17 9/10	10,740	.17 9/10	13,425	37,590

Amount available, $45,000.

a Bid recommended for acceptance, he being the lowest responsible bidder for the best and most suitable material and services.

b Evidence of authority to bid not filed.

c Certificate of guaranty omitted.

Contract in force.

Name and address of contractor.	Character of work.	Date of approval.	Work began.	Expires.
Rittenhouse R. Moore, Mobile, Ala.	Dredging	Oct. 20, 1896	Apr. 20, 1897	Aug. 15, 1897

COMMERCIAL STATISTICS FOR 1896.

[Compiled by Capt. O. Johannesen.]

Exports:

Cotton	bales	153,787
Cotton seed	tons	2,959
Domestics	bales	8,932
Phosphate	tons	38,911
Turpentine	barrels	64,487
Rosin	do	229,158
Timber	feet B. M.	3,568,000
Lumber	do	115,004,000
Cross-ties	number	1,026,078
Shingles	do	7,779,750

	Tons.	Value.
Exports:		
Domestic	370,350	$4,985,322
Foreign		5,728,784
Imports	384,215	4,951,296
Total	754,565	15,665,402

Arrivals and clearances of vessels and commerce at Brunswick, Ga., from January 1, 1878, to December 31, 1896.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1878	116	32,584	850	36	10,218	270	41	19,008	493	193	61,810	1,613
1879	148	44,397	1,000	33	8,235	232	40	17,589	468	221	70,221	1,790
1880	271	77,656	1,891	36	11,219	317	39	14,996	432	346	103,871	2,641
1881	279	100,451	2,239	13	4,174	98	63	30,279	751	355	134,904	3,088
1882	335	123,149	2,659	7	2,095	57	63	26,958	694	405	152,202	3,416
1883	299	110,302	2,368	11	4,814	107	87	40,765	979	397	155,881	3,454
1884	239	88,063	1,893	10	4,434	88	126	62,818	1,435	375	155,315	3,416
1885	242	93,280	1,928	10	3,216	76	94	43,284	1,037	346	139,780	3,052
1886	229	88,244	1,751	7	3,262	48	98	47,798	1,164	334	139,304	2,835
1887	194	86,731	1,625	8	2,251	116	102	54,537	1,232	304	144,519	2,973
1888	821	290,590	3,619	9	2,991	76	147	80,330	1,729	977	373,911	10,424
1889	220	92,831	1,764	29	10,035	176	191	113,757	2,403	431	216,623	4,343
1890	316	196,701	3,844	23	7,513	180	126	71,158	1,559	465	275,372	5,589
1891	374	235,565	5,462	29	8,025	164	107	70,228	1,523	501	313,818	6,149
1892	439	279,998	4,450	42	20,548	354	134	85,332	1,812	615	385,878	6,616
1893	431	255,367	4,392	48	23,384	371	123	93,634	1,710	602	372,385	6,473
1894	382	261,315	4,926	50	25,382	393	173	147,672	2,675	605	434,369	7,994
1895	481	319,399	5,750	25	14,867	242	147	112,957	2,089	653	447,223	8,081
1896	587	344,045	6,503	40	19,999	359	134	63,348	1,852	761	427,392	8,714

CLEARED.

1878	124	32,767	874	28	9,231	236	49	21,218	550	201	63,216	1,660
1879	157	42,345	1,116	21	7,172	172	47	21,730	555	225	71,247	1,843
1880	270	78,913	2,010	14	5,010	115	48	19,970	550	332	103,900	2,675
1881	252	82,155	1,732	17	7,218	156	87	42,659	1,014	356	132,932	1,902
1882	278	96,170	2,086	19	7,761	170	101	48,699	1,139	398	152,630	3,395
1883	257	91,036	1,962	28	11,268	240	124	55,717	1,369	411	158,021	3,571
1884	176	62,927	1,322	38	16,209	335	148	70,612	1,633	362	149,478	3,290
1885	196	71,345	1,481	21	8,696	190	135	62,437	1,456	352	142,478	3,127
1886	184	67,020	1,413	17	7,528	159	117	56,280	1,305	318	130,828	2,877
1887	130	51,305	958	5	5,858	143	121	72,894	1,526	276	130,057	2,627
1888	785	266,152	8,240	13	4,715	116	173	102,300	2,236	971	373,227	10,592
1889	169	65,909	1,273	11	4,266	103	221	130,919	2,830	401	200,994	4,206
1890	247	122,820	2,024	18	8,745	165	172	107,197	2,261	437	238,762	4,450
1891	313	186,171	3,432	26	16,045	234	141	94,827	1,980	480	297,043	5,646
1892	390	247,329	4,228	19	6,882	174	163	109,728	2,334	572	363,939	6,736
1893	420	236,856	4,165	13	6,857	121	159	119,282	2,266	590	362,995	6,552
1894	363	235,307	4,481	14	6,081	125	223	193,483	3,260	600	434,871	7,886
1895	458	290,702	5,260	9	4,155	103	182	148,892	2,811	649	443,749	8,174
1896	591	323,357	5,759	18	8,638	173	150	112,446	2,248	759	444,441	8,180

Arrivals and clearances of vessels and commerce at Brunswick, Ga., etc.—Continued.

COMMERCE.

Year.	Value of exports.	Value of imports.	Total collection.	Year.	Value of exports.	Value of imports.	Total collection.
1878	$1,372,842	$400	$4,500.97	1888 *	$7,552,025	$3,140,231	$7,438.04
1879	1,394,401	3,197	5,644.33	1889	7,894,281	6,557	8,933.66
1880	1,702,570	8,098	17,723.27	1890	7,355,841	7,326	5,748.00
1881	2,230,000	4,377	29,305.30	1891 *	9,742,553	3,014,207	5,982.07
1882	1,700,000	2,734	20,058.90	1892	5,372,775	22,988	6,406.15
1883	3,437,000	3,093	24,911.61	1893 *	7,297,973	1,680,512	5,768.00
1884	3,500,000	958	19,780.32	1894 *	9,940,453	3,549,378	9,141.41
1885	3,063,960	4,008	3,939.27	1895 *	7,520,404	3,328,407	7,422.10
1886	2,828,656	2,397	5,834.43	1896	5,727,074	15,072	8,047.11
1887 *	4,121,660	2,815,769	37,520.00				

* Coastwise and foreign.

Statement of receipts of naval stores

Year.	Stock on hand.		Receipts for year.		Total.	
	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.	Spirits.
	Barrels.	*Barrels.*	*Barrels.*	*Barrels.*	*Barrels.*	*Barrels.*
1880	3,000	600	36,495	8,661	39,495	9,261
1881	2,935	240	67,562	13,490	70,297	13,730
1882	15,191	2,100	104,357	23,459	119,548	25,559
1883	19,791	2,200	80,078	16,105	99,769	18,305
1884	15,236	893	105,622	23,449	120,858	24,342
1885	8,016	1,610	92,958	30,900	100,974	22,510
1886	11,963	2,786	139,366	34,625	151,329	37,410
1887	45,337	1,161	125,546	32,338	170,883	33,459
1888	27,098	2,420	140,820	37,643	167,918	40,063
1889	.....	.....	186,000	45,000	.....	.....
1890	31,869	2,259	212,374	42,813	244,243	45,073
1891	29,421	1,088	161,402	42,697	190,823	43,875
1892	30,294	651	220,250	52,496	250,544	53,147
1893	20,847	4,005	172,412	43,100	193,259	47,105
1894	.....	.....	187,912	46,954	187,912	46,954
1895	35,000	1,500	268,349	53,329	303,349	54,829
1896	35,507	1,441	259,103	66,286	294,610	67,727

THOS. W. LAMB, *Collector of Customs.*

Capt. O. M. CARTER,
Corps of Engineers.

N 9.

IMPROVEMENT OF CUMBERLAND SOUND, GEORGIA.

The entrance to Cumberland Sound is situated between Cumberland Island, Georgia, and Amelia Island, Florida.

ORIGINAL CONDITION.

The available depth of the entrance in its unimproved condition varied from 11 to 12.5 feet at mean low water. The mean rise and fall of tide is 5.9 feet.

PLAN OF IMPROVEMENT.

The original plan for improving the entrance to Cumberland Sound was submitted in 1879, and is given in Appendix I 8, Annual Report of the Chief of Engineers for that year. The revised plan of improvement was submitted in 1891, and is contained in Appendix N, Annual

Report of the Chief of Engineers for that year. A second revision of the original plan of improvement, rendered necessary from the fact that funds were supplied irregularly and in entirely inadequate amounts for the proper prosecution of the work, was submitted on June 12, 1895, and is contained in the Report of the Chief of Engineers for 1896, page 1293. This plan of improvement was submitted to a Board of Engineers, whose report, dated December 18, 1895, is given in the Report of the Chief of Engineers for 1896, page 1289. It contemplates the construction of two jetties, composed of riprap stone with a mattress hearting whenever admissible, resting upon a foundation mattress of brush or of logs and brush, starting respectively from the shores on opposite sides of the entrance and extending seaward across the bar upon lines so directed that the ends resting in 30 feet at mean low water will be parallel to each other and about 3,900 feet apart. These jetties are intended to establish a mean low-water channel across the bar not less than 19 feet in depth.

This project was authorized by law of June 3, 1896, and in accordance with it work has been carried on during the fiscal year just ended.

The cost of the improvement was originally estimated at $2,071,023; as revised in 1891 at $2,079,500, and as revised in 1895 at $2,350,000.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Nothing was ever expended in improving the entrance to Cumberland Sound previous to the adoption of the original project of 1879. Since then appropriations have been made by Congress for the work aggregating $1,287,000.

A summary of operations prior to July 1, 1895, is given in my report for 1896 (Report of the Chief of Engineers for 1896, pp. 1286 and 1287). No work was done in the fiscal year ending June 30, 1896.

CONDITION OF WORK JUNE 30, 1896.

So far as known, the condition of the unfinished jetties and of the channel was the same as that reported at the end of the fiscal year of 1895.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

The river and harbor act approved June 3, 1896, contained an appropriation of $5,000 for continuing this improvement, with the following provision:

> *Provided*, That contracts may be entered into by the Secretary of War for such material and work as may be necessary to complete the present project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million three hundred and forty-five thousand dollars, exclusive of amounts herein and heretofore appropriated.

Under this provision a contract was entered into with the Atlantic Contracting Company, of New York, N. Y., for all work required for the improvement.

Under said contract, which was awarded October 8, 1896, jetty work was commenced December 7 and continued to the end of the fiscal year. Operations extended ever Range 3 of the north jetty and Ranges 2 and 9 of the south jetty.

North jetty.—About 25 feet of the outer end were found to have been destroyed and had to be replaced; the jetty work, therefore, had to be

started at 18,260.7 instead of 18,285, but the length of new work is counted from the latter station. Six courses of brush mattresses, loaded with riprap stone, were carried from 18,285 to 19,674.2, a distance of 1,389.2 feet, the three lower courses being 100 feet wide and the three upper courses being 80 feet wide. Eight courses of brush mattresses, loaded with riprap stone, were carried on Range 3 from Station 19,674.2 to Station 19,862.8, a distance of 188.6 feet, the four lower courses being 100 feet wide and the four upper courses being 80 feet wide. There were placed in this work 92,345.34 square yards of brush mattresses, 4,794.30 cubic yards of third-class stone, and 842.94 cubic yards of fourth-class riprap stone. At the outer end of the jetty, viz, at Station 19,862.8, the depth of water is 28.3 feet at mean low water.

South jetty.—Six courses of brush mattresses, loaded with riprap stone, were carried on Range 9 from Station 10,062.5 to Station 11,986.5, a distance of 1,924 feet, the three lower courses being 100 feet wide and the three upper courses being 80 feet wide. Eight courses of brush mattresses, loaded with riprap stone, were carried on Range 9 from Station 11,986.5 to Station 13,854.7, a distance of 1,868.2 feet, the four lower courses being 100 feet wide and the four upper courses being 80 feet wide. There were placed in this work 253,942.38 square yards of brush mattresses, 4,036.65 cubic yards of third-class riprap stone, and 8,018.35 cubic yards of fourth-class riprap stone. Besides this, 607.01 cubic yards of third-class riprap stone was used in repairs on the second Range between 3,591.6 and 3,991.6. At the outer end of the jetty, viz, at Station 13,854.7, the depth of water is 30 feet at mean low water.

Altogether, there have been used on the entire work during the fiscal year 346,287.72 square yards of brush mattresses, 9,437.96 cubic yards of third-class, and 8,861.29 cubic yards of fourth-class riprap stone.

A survey of the entrance to Cumberland Sound was made in May and June.

CONDITION OF WORK JUNE 30, 1897.

The unfinished jetties are in good condition and are covered with sand. The sailing line still crosses the south jetty, but from the crossing outward follows a somewhat more southerly course than before, its present bearing being about S. 78° 50 E. It reaches deep water at a distance of a little more than a mile from the jetty crossing and at a point nearly half a mile south of the outer end of the south jetty. The shoalest point on this line is found near its outer end, where the inner and the outer 15-foot curves are separated by a belt from 300 to 500 feet wide with least mean low-water depths of only about 13 feet.

COMMERCE AND NAVIGATION.

All the commerce of St. Marys, Ga., and 90 per cent of the commerce of Fernandina, Fla., are dependent upon waterway transportation through Cumberland Sound.

The Florida Central and Peninsular Railway, terminating at Fernandina, besides traversing a fertile and well-timbered country, pierces also the Florida phosphate fields, and much of the rock from the phosphate fields is brought by this road to Fernandina for shipment to coastwise and foreign ports. For the handling of this increased traffic the railroad has built new wharves, erected a large elevator, and extended its terminal facilities. From information derived from the owners of the

principal mines, it is estimated that the annual shipments of rock will aggregate about 300,000 tons.

The Mallory Line has two steamships per week plying between Fernandina and New York, which carry annually about 61,000 tons of freight. Fifteen steamers per week ply between Fernandina and local coastwise ports, and a large fleet of foreign and coastwise vessels is engaged in the commerce of this port.

In 1896 the shipments, foreign and coastwise, amounted to 220,000 tons, valued at about $9,000,000.

MISCELLANEOUS.

The work is located in two collection districts, the north jetty being in the district of St. Marys, Ga., and the south jetty in that of Fernandina, Fla. Amount of duties collected at St. Marys during 1896, $—; at Fernandina, $195. Amelia Light is the nearest light-house, and Fort Clinch, Fla., the nearest fort.

The period of great depths on which the channel entered in 1893, and which lasted until quite recently, seems to be ended, and shoaling seriously threatens the commerce of the port.

The discharge finds so much resistance in the long, shallow south channel that a new short northern route is opening, the location of which is nearly parallel to the north jetty at a distance of about 1,000 feet from it. If the barrier still remaining between the outer end of this channel and the ocean is removed and the channel opened throughout its entire length for navigation, the present sailing gap can be closed, the great volumes escaping through it directed between the jetties and the channel locus permanently held at that place. For the execution of this work the favorable moment has arrived. A sum of $50,000 is required immediately for sluicing and dredging and $450,000 for jetty work under the present contract. For further details in regard to this matter, I refer to my special report to the Chief of Engineers of June 15, 1897, which is appended hereto.

The total expenditures under existing project to June 30, 1896, including all outstanding liabilities, were $452,500.

The existing project of improvement has up to this time been unsuccessful for the sole reason that funds have not been supplied regularly and in adequate amounts.

Money statement.

July 1, 1896, balance unexpended		$5,000.00
Amount appropriated by sundry civil act approved June 4, 1897		350,000.00
		355,000.00
June 30, 1897, amount expended during fiscal year		4,170.99
July 1, 1897, balance unexpended		350,829.01
July 1, 1897, outstanding liabilities	$449,360.63	
July 1, 1897, amount covered by uncompleted contracts	1,692,510.98	
July 1, 1897, amount to be paid to contractor on account		345,000.00
July 1, 1897, balance available for contingencies		5,829.01
Amount (estimated) required for completion of existing project		1,995,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		1,500,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project for improving Cumberland Sound the following appropriations were made for the work:

By act of Congress of—		By act of Congress of—	
June 14, 1880	$30,000	August 5, 1886	$112,500
March 3, 1881	100,000	August 11, 1888	112,500
August 2, 1882	50,000		
July 5, 1884	75,000	Total	480,000

Under the revised project of improvement the following appropriations were made:

By act of Congress of—	
September 19, 1890	$112,500
July 13, 1892	170,000
August 17, 1894	170,000
Total	452,500

Under the existing project of improvement the following appropriations have been made:

June 3, 1896	$5,000
June 4, 1897	350,000
Total	355,000

Abstract of bids opened at Savannah, Ga., September 8, 1896, by Capt. O. M. Carter, Corps of Engineers, for constructing jetties at entrance to Cumberland Sound, Georgia.

No.	Name and address of bidder.	Mattresses (200,000 square yards).		First-class stone (50,000 tons).		Second-class stone (75,000 tons).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.
1	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y. *a*.	$1.10	$220,000	$5.25	$262.500	$5.25	$393.750
2	Jacob Friday & Sons. Pittsburg, Pa. *b* ..	1.12	224,000	5.00	250,000	5.00	375,000
3	John L. Grim, Philadelphia, Pa.....	1.15	230,000	5.20	260,000	5.20	390,000

No.	Name and address of bidder.	Third-class stone (100,000 cubic yards).		Fourth-class stone (250,000 cubic yards).		Total.
		Price.	Amount.	Price.	Amount.	
1	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y. *a*.	$3.90	$390,000	$3.50	$875,000	$2,141,250
2	Jacob Friday & Sons, Pittsburg, Pa. *b* ..	4.50	450,000	3.40	850,000	2,149,000
3	John L. Grim, Philadelphia, Pa.....	3.90	390,000	3.55	887,500	2,157,500

REMARKS.—Amount for which the Secretary of War is authorized to enter into contracts, $2,350,000.
a Bid recommended for acceptance, that company being the lowest responsible bidder for the most satisfactory materials and service.
b Justification of the guaranty omitted.

Contract in force.

Name and address of contractor.	Character of work.	Date of approval.	Work began.	Expires.
The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y.	Jetty	Oct. 8, 1896	Dec. 7, 1896	On or before the expiration of one year after the total sum of money for which the Secretary of War is authorized to enter into contract under these specifications shall have been appropriated.

Arrivals and clearances of vessels and commerce at Fernandina, Fla., from January 1, 1875, to December 31, 1896.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1875.....	212	117,363	4,193	47	10,379	359	12	7,437	135	271	135,179	4,686
1876.....	210	141,854	4,749	26	4,893	179	28	9,232	249	263	155,479	5,177
1877.....	150	100,581	3,343	31	2,768	217	40	12,547	404	231	121,896	3,964
1878.....	183	120,845	3,900	17	3,985	101	23	8,294	215	222	133,124	4,216
1879.....	205	133,020	4,138	28	10,634	252	10	5,639	128	243	149,293	4,516
1880.....	270	146,722	4,470	34	22,396	598	22	9,463	240	326	180,581	5,308
1881.....	273	171,548	4,186	17	11,899	314	24	11,553	271	278	195,040	4,771
1882.....	239	146,888	3,279	16	9,056	242	15	6,639	151	270	162,079	3,672
1883.....	193	96,937	2,453	6	1,769	43	14	5,229	137	203	103,935	2,633
1884.....	176	105,061	2,394	8	885	21	10	4,029	88	189	109,755	2,973
1885.....	199	111,698	3,131	7	999	47	22	9,785	210	198	122,482	3,388
1886.....	205	147,418	4,014	7	2,112	53	15	5,187	146	227	154,717	4,213
1887.....	349	317,798	5,030	19	6,402	122	22	8,565	220	390	332,965	5,372
1888.....	274	179,130	4,456	19	7,152	156	18	6,789	177	311	193,071	4,789
1889.....	262	164,229	3,906	49	16,434	389	39	12,936	363	349	193,594	4,640
1890.....	267	172,202	3,948	40	14,683	305	33	11,518	306	340	198,403	4,559
1891.....	226	164,568	3,530	18	6,175	140	34	17,654	433	278	188,417	4,103
1892.....	247	189,855	3,760	28	10,027	195	54	39,487	805	327	239,361	4,760
1893.....	218	171,595	3,349	17	6,779	166	52	34,824	750	287	213,198	4,265
1894.....	149	148,543	3,077	21	8,030	162	44	51,401	899	214	708,014	4,138
1895.....	174	176,312	3,360	14	6,010	118	30	26,212	618	218	218,434	4,094
1896.....	169	124,046	2,051	17	7,015	127	30	37,052	659	216	168,113	2,837

CLEARED.

1875.....	229	121,028	03	31	8,229	228	15	5,343	212	275	134,610	4,743
1876.....	244	161,154	58	31	6,040	147	26	9,003	369	291	166,196	5,474
1877.....	165	106,615	60	24	6,340	166	42	13,741	413	231	126,696	4,168
1878.....	195	124,862	66	19	4,911	123	26	9,060	288	240	138,874	4,445
1879.....	175	129,654	79	31	11,087	258	12	8,016	164	218	148,757	4,501
1880.....	244	155,659	06	31	14,207	327	24	10,202	240	299	180,068	5,072
1881.....	204	138,593	30	41	22,007	506	31	15,335	351	276	175,940	4,587
1882.....	217	136,668	06	39	15,497	370	31	14,963	321	287	167,125	3,657
1883.....	153	85,815	45	21	8,925	210	24	9,413	231	209	94,153	2,681
1884.....	178	104,482	88	27	8,231	178	15	6,488	158	210	119,781	3,022
1885.....	185	112,936	70	33	10,251	249	21	9,393	231	239	132,580	3,440
1886.....	214	153,092	06	27	9,072	200	28	9,817	299	267	171,981	4,707
1887.....	306	326,942	00	29	8,552	283	33	11,807	327	368	346,501	5,054
1888.....	260	175,490	06	28	9,190	184	20	8,622	204	328	193,302	4,974
1889.....	296	181,975	40	46	13,652	342	45	16,286	428	389	211,913	5,010
1890	276	176,320	74	41	14,394	317	34	13,149	319	351	203,873	4,709
1891.....	226	156,272	07	18	6,407	196	49	31,117	702	295	193,796	4,345
1892.....	244	183,940	68	23	8,784	174	77	58,428	1,116	344	329,352	4,958
1893	191	137,724	61	17	6,606	137	75	63,847	1,224	283	207,676	4,122
1894.....	153	100,898	26	25	9,283	189	53	44,163	896	231	304,360	4,313
1895.....	186	200,201	82	13	4,519	96	23	18,897	349	221	223,617	4,127
1896.....	163	127,101	66	19	6,637	134	37	37,228	665	218	170,966	2,755

Arrivals and clearances of vessels and commerce at Fernandina, Fla., etc.—Continued.

COMMERCE.

Year.	Value of exports.		Value of imports.		Total commerce.	Duties collected.
	Foreign.	Coastwise.	Foreign.	Coastwise.		
1875	$209,791	$1,119,979	$14,304	$755,718	$2,089,792	$1,817.84
1876	226,076	1,170,240	46,179	1,131,052	2,573,527	2,181.40
1877	310,225	676,855	19,304	1,146,363	2,152,747	2,376.00
1878	249,000	780,607	8,142	172,234	1,201,983	2,000.00
1879	375,470	921,368	11,088	1,360,432	2,568,308	3,424.00
1880	257,780	667,092	3,676	1,366,857	2,294,405	7,808.00
1881	242,100	1,064,394	11,791	1,786,545	3,104,831	8,183.00
1882	292,400	1,342,421	45,792	7,536,588	9,217,201	36,590.00
1883	248,600	2,573,010	11,229	2,262,755	5,095,594	5,566.00
1884	173,690	1,184,462	1,674	1,738,620	3,078,856	1,831.00
1885	214,726	2,184,541	4,180	1,502,544	[illegible]91	1,451.28
1886	191,595	2,843,000	590	1,625,000	85	808.09
1887	226,960	3,500,000	29,896	2,000,000	58	3,400.00
1888	175,150	2,500,000	.....	859,000	59	4,655.06
1889	326,980	3,970,190	601	2,150,000	61	5,712.40
1890	478,475	2,245,759	19,902	4,997,683	13	7,335.82
1891	776,251	1,708,276	.....	2,938,000	27	None.
1892	1,889,043	1,125,543	701	6,500,000	87	3,604.22
1893	1,412,920	1,804,330	214	7,000,786	50	96.20
1894	1,419,588	553,485	.....	7,373,088	08	85.93
1895	1,467,305	570,295	3	2,380,627	80	3.00
1896	1,280,682	486,509	27,303	84,200	88	196.09

Capt. O. M. CARTER,
Corps of Engineers.

G. S. BALTZELL,
Collector of Customs.

Arrivals and clearances of vessels and commerce at St. Marys, Ga., from January 1, 1879, to December 31, 1896.

ARRIVED.

Year.				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1879	53	16,773	378	6	2,303	54	14	5,155	143	73	24,231	475
1880	30	8,982	204	2	694	17	16	6,409	185	48	16,085	404
1881	22	7,541	156	6	2,491	54	25	11,282	290	53	21,324	500
1882	28	10,504	196	1	371	7	15	5,723	[illegible]	44	16,598	347
1883	26	9,596	182	3	1,207	24	6	2,112	44	35	12,913	250
1884	32	11,294	224	1	539	9	6	2,334	57	39	14,065	280
1885	40	13,042	280	1	896	8	5	3,028	52	46	15,456	340
1886	20	7,882	140	1	321	7	6	2,086	56	27	10,288	203
1887	37	13,247	222	1	405	9	8	4,396	90	46	17,988	321
1888	55	20,897	440	1	433	8	3	1,365	32	36	[illegible]	480
1889	60	24,000	540	9	3,575	70	14	5,571	133	83	33,146	743
1890	39	16,328	300	6	2,058	45	7	2,856	68	52	21,242	413
1891	44	18,578	332	1	330	8	2	747	20	47	19,655	350
1892	68	29,417	540	9	3,288	68	6	3,177	64	83	35,877	672
1893	54	23,495	432	5	2,172	40	2	883	19	61	26,320	432
1894	49	22,721	398	6	2,661	39	3	1,766	31	58	27,148	468
1895	57	29,258	456	4	2,437	36	1	534	10	62	32,229	502
1896	46	21,385	376	2	717	13	7	3,726	73	55	25,828	461

CLEARED.

1879	53	16,773	378	10	3,577	83	14	5,156	143	77	25,505	604
1880	30	8,982	202	3	1,150	27	12	4,979	132	45	15,111	361
1881	22	7,541	156	7	3,362	68	29	12,463	323	58	23,396	547
1882	28	10,504	196	4	1,567	32	18	6,791	175	50	18,862	403
1883	26	9,596	182	3	1,207	24	6	2,112	46	35	12,915	253
1884	32	11,294	224	2	1,097	19	6	2,234	57	[illegible]	14,626	300
1885	40	13,042	280	3	1,196	25	4	1,596	42	47	15,732	347
1886	20	7,882	140	5	2,812	40	5	1,646	45	30	11,940	210
1887	37	13,247	222	1	425	9	8	4,396	90	3	4,396	90
1888	56	21,330	448	5	2,096	41	5	1,587	46	66	25,273	535
1889	60	24,000	540	9	3,575	70	14	5,571	133	83	33,146	743
1890	39	16,322	300	3	877	21	7	1,856	66	10	3,733	69
1891	1	1	1	5	2,265	38	2	818	18	7	3,083	58
1892	68	29,417	540	7	3,089	57	6	3,177	64	81	35,683	661
1893	58	25,225	464	5	2,061	41	3	1,152	29	[illegible]	[illegible]	534
1894	52	24,696	425	4	1,253	28	3	1,766	31	59	27,718	484
1895	57	29,258	456	5	2,333	41	2	1,094	22	[illegible]	32,685	519
1896	46	21,385	376	2	976	23	7	3,726	73	55	25,828	461

Arrivals and clearance of vessels and commerce at St. Marys, Ga.—Continued.

COMMERCE.

Year.	Value of exports.	Year.	Value of exports.
1879	$82,491	1888	$212,045
1880	70,411	1889	343,496
1881	149,333	1890	37,867
1882	47,216	1891	32,300
1883	76,902	1892	353,629
1884	22,517	1893	25,315
1885	27,127	1894	26,413
1886	36,520	1895	25,544
1887	482,500	1896	38,495

PETER R. ARNOW,
Collector of Customs.

Capt. O. M. CARTER,
Corps of Engineers.

REPORT ON CONDITION OF THE HARBOR AT CUMBERLAND SOUND.

[Printed in Senate Doc. No. 163, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., June 25, 1897.

SIR: I have the honor to acknowledge receipt of concurrent resolution No. 9, passed by the Senate May 26, 1897, and by the House of Representatives June 10, 1897, requesting the Secretary of War—

to furnish the Congress with such information as he may have in his possession with reference to the present condition of the harbor of Cumberland Sound, and to inform the Congress whether any immediate action is necessary to protect the entrance from being closed against the commerce usually entering the port of Fernandina.

In answer to the reference of the above resolution to this office for report I have the honor to submit the accompanying copy of letter of June 15, 1897, with two maps,* from Capt. O. M. Carter, Corps of Engineers, on the subject, and beg to invite attention to the views of that officer as expressed in the closing paragraph, as follows:

In view of the urgency of the situation, and of the manifest advantages to the United States of aiding artificially in opening the new channel now, I am of opinion that the sum of $500,000 should be made available immediately, $50,000 of which should be used for sluicing and dredging, and the balance for raising the north and south jetties under the existing contract, without which work dredging will give no satisfactory or permanent relief.

The concurrent resolution is herewith returned.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

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* Not reprinted. Printed in Senate Doc. No. 163, Fifty-fifth Congress, first session.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., June 15, 1897.

GENERAL: In compliance with your instructions of the 11th instant, and in accordance with the provisions of a concurrent resolution of Congress—

That the Secretary of War be requested to furnish the Congress with such information as he may have in his possession with reference to the present condition of the harbor at Cumberland Sound, and to inform the Congress whether any immediate action is necessary to protect the entrance from being closed against the commerce usually entering the port of Fernandina,

I have the honor to submit the following report:

The project for improving the entrance to Cumberland Sound, which was submitted by the late Gen. Q. A. Gillmore, Corps of Engineers, in 1879, and which was revised in 1891, and again in 1895, aims at securing a navigable depth across the bar of 19 feet at mean low water. The mean rise and fall of tide is 5.9 feet.

Operations under that project were begun in 1880, but on account of the lack of any system in supplying funds, which have been provided at long intervals and in totally inadequate amounts, it has been impossible to push forward the works with proper energy, hence they have not obtained at any time the desired controlling influence on the most important hydrographic feature, the channel location, and the navigable bar channel has deserted the desired route entirely, the present channel crossing the south jetty about 7,000 feet seaward of its initial point. From the jetty crossing the sailing range runs about south 78° 50′ east, reaching deep water at a distance of somewhat more than a mile and at a point nearly half a mile south of the outer end of the south jetty. The shoalest point on this line is found near its outer end, where the inner and the outer 15-foot curves are separated by a belt from 300 to 500 feet wide, with least mean low-water depths of somewhat less than 13 feet.

A comparison of the various surveys made since 1888 shows, as might be expected under the circumstances, a gradual shifting of the channel to the south. Moreover, the period of increased depths upon which the channel entered in 1893 and which lasted until quite recently is ended, the shoaling seriously threatening the commerce of the port of Fernandina.

The discharge finds so much resistance in the long, shallow south channel that a new short northern route is opening, its location being nearly parallel to the north jetty and about 1,000 feet from it, thus forming an almost direct continuation of the deep water of Amelia basin. The erosion of this new channel began in 1895, following the extension of the north jetty, and has advanced so rapidly that the channel now extends more than 3,000 feet into the shoal, with a least width of more than 400 feet between the 12-foot curves. Depths of more than 3 fathoms are now found where a sand shoal, bare at low water, existed a few years ago. Between the extreme easterly end of this 12-foot pocket and the 12-foot curve outside the bar there is still a stretch of about half a mile of lesser depth. This barrier is daily decreasing, and there is reason to believe that sooner or later it will break down altogether and an uninterrupted new north channel be established, when the closing of the gap in the south jetty can be commenced.

The river and harbor act of June 3, 1896, appropriated $5,000 for improving Cumberland Sound, and provided—

That contracts may be entered into by the Secretary of War for such material and

work as may be necessary to complete the present project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million three hundred and forty-five thousand dollars, exclusive of amount herein and heretofore appropriated.

Under the provisions of that act a contract was entered into on October 8, 1896, with the Atlantic Contracting Company. of New York, for all of the material and labor necessary to complete the work. Operations have been carried on with such vigor by that company that the funds provided by the sundry civil bill of June 4, 1897, will not suffice to pay for what has been done already.

Presumably, however, there is a limit to the readiness and the ability of the company to continue work without payment, and that the limit may be reached during this critical period when the new north channel is in process of formation when an opportunity is afforded to close the sailing gap in the south jetty to confine the channel between the jetties and increase the scour there, all without interfering with navigation, and when a failure to do this immediately means the loss of an opportunity for quick success, which may not be presented again, and the probable closing of the port of Fernandina against much of its usual commerce.

In view of the urgency of the situation and of the manifest advantages to the United States of aiding artificially in opening the new channel now, I am of opinion that the sum of $500,000 should be made available immediately, $50,000 of which should be used for sluicing and dredging, and the balance for raising the north and south jetties under the existing contract, without which work dredging will give no satisfactory or permanet relief.

Two charts accompany this report.

Respectfully submitted.

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

N 10.

IMPROVEMENT OF THE INSIDE WATER ROUTE BETWEEN SAVANNAH, GEORGIA, AND FERNANDINA, FLORIDA.

The location of this route is shown by a dotted line on Coast Survey Charts Nos. 156 and 157, and a detailed description of it is given in my report of a survey dated November 25, 1891, which is printed as part of Appendix N 12, Annual Report of the Chief of Engineers for 1892, pages 1311–1326. (See also subsequent reports.)

The distance from Savannah to Fernandina by the inside route just described is about 160 miles.

Touching at Darien en route increases the distance by about 20 miles, and at Brunswick by about 12 miles.

PLAN OF IMPROVEMENT.

The original project of improvement adopted in 1892 provides for the establishment of a channel 7 feet deep at mean low water between Savannah, Ga., and Fernandina, Fla. This is to be accomplished by the improvement of Romerly Marsh, Mud River, Little Mud River, and

Jekyl Creek by means of dredging and the construction of closure dams and training walls of brush mattresses loaded with riprap stone. The estimated cost of the improvement is $105,000, provided that the entire sum is made at once available. If funds are made available in smaller amounts, the cost of the improvement will be greatly increased.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1896.

Operations have been confined to Jekyl Creek. Dredging was commenced in 1889, the construction of a training wall at the mouth in 1891 by means of appropriations made not for the inside route but for the specific improvement of Jekyl Creek. The entire work done by means of appropriations under both of these titles has been as follows: There were put into the training wall at the mouth of Jekyl Creek 30,069.62 square yards of brush mattresses, 28.17 cubic yards of brush fascines, and 3,461.96 cubic yards of stone; there was also driven one cluster of fender piles. There was removed by dredging 22,375.55 cubic yards of material from the shoal inside of the creek and 40,955.42 cubic yards of material from the shoal outside of the creek, making a total of 63,330.97 cubic yards of material removed by dredging.

Up to June 30, 1896, the total expenditures, including all outstanding liabilities, amounted to $35,000.

For a detailed history of early work see page 1604 of the Annual Report of the Chief of Engineers for 1893 and the annual reports of the same officer since that date.

CONDITION OF IMPROVEMENT JUNE 30, 1896.

So far as known the training wall at the mouth of Jekyl Creek and the dredged channel at and near the same locality were in good condition.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

No operations for improving the inside route have been carried on during the fiscal year ending June 30, 1897, and no changes in the condition of the training wall have taken place; the channel has shoaled about 1 foot at a place inside and at another outside, the length of the bars thus formed being respectively 1,500 and 1,100 feet.

A contract was entered into September 25, 1896, with Rittenhouse R. Moore, of Mobile, Ala., for dredging.

COMMERCE AND NAVIGATION.

The inside route is of great value to the coasting trade between Savannah and Fernandina and intermediate points. On portions of this route regular lines of boats have been established, but most of the business on these waters is done by towboats and other craft passing over the whole or a portion of the route at irregular intervals.

Besides the boats mentioned above, there is a large fleet of schooners and sloops of 3 to 40 tons register plying the Inside Route, carrying naval stores, rice, ties, garden produce, oysters, fish, and general merchandise in their season.

Over portions of the inside route vessels are towed from one sound to another to avoid going to sea, as through Mud River, between Doboy and Sapelo sounds, and through Jekyl Creek, between St. Simon and St. Andrew sounds. A very much larger number of vessels would

pass through Mud River were it properly improved. Because of insufficient depth there were towed in rafts through Mud River during the calendar year of 1896 about 12,000,000 feet of lumber. In order to find a suitable outlet to the sea nearly 30,000,000 feet of logs were towed over the inside route from Darien to St. Simons Mills, where it was converted into lumber and taken to sea over St. Simons Bar.

It has been impossible to tell exactly how much commerce has passed along the inside route during the year 1896, but it approximates 20,000 tons of freight, valued at $2,000,000.

MISCELLANEOUS.

This work is located in the collection districts of Savannah, Brunswick, St. Marys, Ga., and Fernandina, Fla. The amount of duties collected in 1896 was: Savannah, $36,149.82; Brunswick, $8,047.11; St. Marys, nothing; and Fernandina, $195, respectively. The nearest light-houses are those upon the Savannah River, near the beginning, and Amelia Light at the end of the route, with Sapelo, Wolf Island ranges, St. Simon, and Little Cumberland lights between. Forts Oglethorpe and Pulaski, Ga., and Clinch, Fla., are the nearest forts.

All of the two first appropriations have been expended at Jekyl Creek. Four appropriations, aggregating $24,000, have also been made for the specific improvement of Jekyl Creek. That improvement has now been completed, but the sum of $2,500 will be required for annual maintenance.

The total expenditures under this present project up to June 30, 1897, including all outstanding liabilities, were $36,759.49.

It is proposed to expend the appropriation of June 3, 1896, in executing works of improvement as outlined in my report of November 25, 1891.

The sum of $56,000 can be advantageously and economically expended during the coming year. Unless the sum asked for is appropriated at once the cost of the work will be greatly increased.

Money statement.

July 1, 1896, balance unexpended		$14,000.00
June 30, 1897, amount expended during fiscal year		1,489.49
July 1, 1897, balance unexpended		12,510.51
July 1, 1897, outstanding liabilities	$270.00	
July 1, 1897, amount covered by uncompleted contracts	11,000.00	
		11,270.00
July 1, 1897, balance available		1,240.51
Amount (estimated) required for completion of existing project		56,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		56,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the existing project for improving this route was adopted three appropriations, aggregating $49,000, have been made as follows:

By act of Congress of—	
July 13, 1892	$15,000
August 17, 1894	20,000
June 3, 1896	14,000
Total	49,000

Abstracts of bids opened at Savannah, Ga., September 8, 1896, by Capt. O. M. Carter, Corps of Engineers, for dredging in Darien Harbor, Brunswick Harbor, and inside water route between Savannah and Fernandina.

No.	Name and address of bidder.	Dredging in Darien Harbor, Georgia (75,000 cubic yards).		Dredging in Brunswick Harbor, Georgia (60,000 cubic yards).		Dredging along inside water route (75,000 cubic yards).		Total.
		Price.	Amount.	Price.	Amount.	Price.	Amount.	
1	Savannah Dredging Co., Jacob Paulsen, president, Savannah, Ga.	$0.14	$10,500	$0.16	$9,600	$0.13½	$10,125	$30,225
2	Rittenhouse R. Moore, Mobile Ala. *a*	.12	9,000	.14	8,400	.10	7,500	24,900
3	American Dredging Co., S. Y. Schermerhorn, president, Philadelphia, Pa. *b*	.17	12,750	.18	10,800	.16	12,000	35,550
4	P. Sanford Ross, Jersey City, N. J	.15	11,250	.16	9,600	.14	10,500	31,350
5	Virginia Dredging Co., J. Clement Shafer, president, Richmond, Va. *c*	.17 9/10	13,425	.17 9/10	10,740	.17 9/10	13,425	37,590

a Bid recommended for acceptance, he being the lowest responsible bidder for the best and most suitable materials and services.
b Evidence of authority to bid not filed.
c Certificate to guarantee omitted.
Amount available, $45,000.

Contract in force.

Name and address of contractor.	Character of work.	Date of approval.	Work began.	Expires.
Rittenhouse R. Moore, Mobile, Ala.	Dredging	Oct. 20, 1896		Aug. 15, 1897

N 11.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

UNKNOWN WRECK, DARIEN HARBOR, GEORGIA.

On April 9, 1897, the Secretary of War allotted $900 for the purpose of removing the wreck of a wooden vessel or a raft of logs at Brown John Shoal, Darien River, Georgia. The work of removing this wreck will be undertaken early during the coming fiscal year.

N 12.

SURVEY OF DOBOY BAR, GEORGIA, WITH A VIEW TO SECURING A DEPTH OF 24 FEET MEAN HIGH WATER, AND TO ASCERTAIN WHETHER THE PRESENT OBSTRUCTION CAN BE REMOVED BY MEANS OF DREDGING.

[Printed in House Doc. No. 13, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., March 22, 1897.

SIR: The river and harbor act of June 3, 1896, in the item of appropriation for improving harbor at Darien, Ga., directs the Secretary of War "to report what is necessary to be done to deepen the bar known as Doboy Bar to 24 feet at mean high water, and whether the present

obstruction can not be removed by means of dredging, and what the estimates of cost may be."

The duty of making the report thus called for was assigned to Capt. O. M. Carter, Corps of Engineers, and I now have the honor to submit the accompanying copy of his report, dated February 25, 1897, with map,* giving the results of a survey of the locality in question.

Captain Carter states that the material composing the bar is a mixture of fine sand and fragments of shells and, when loosened and thrown into suspension, is easily moved, and that such material can be handled readily by a hydraulic dredge.

To dredge a channel 300 feet wide and 24 feet deep at mean high water along the line proposed by Captain Carter, and shown on map, will require the removal of about 450,000 cubic yards of material. Should it be practicable to secure the use of a Government hydraulic dredge for this work, which is doubtful, it is estimated that the cost of opening the channel as proposed will not exceed $45,000. If no such dredge be available, the cost will be about $70,000. The cost of maintenance is indeterminate. Unless sufficient funds be provided at one time to complete the improvement, Captain Carter recommends that no work whatever be done there. In his opinion the improvement of Doboy Bar is worthy of being undertaken by the General Government only to the extent and under the conditions stated in the accompanying report, and these views are concurred in by the division engineer, Col. Peter C. Hains, Corps of Engineers.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., February 25, 1897.

GENERAL: The river and harbor act of 1896 directs the Secretary of War "to report what is necessary to be done to deepen the bar known as Doboy Bar to 24 feet at mean high water, and whether the present obstruction can not be removed by means of dredging, and what the estimates of cost may be."

Doboy Bar is a shifting fan-shaped sand shoal, obstructing the entrance to Doboy Sound, and extending from Sapelo Island on the north to Wolf Island on the south.

The first known survey of that bar was made by the United States Coast and Geodetic Survey in 1868. At that time the bar, whose general direction has not changed since, extended east-southeast from the southern end of Sapelo Island for a distance of about 3.5 miles, thence in a southerly direction about parallel to the coast line for nearly 3 miles, connecting with the shoals which extend about east-southeast from the northern end of Wolf Island.

From the mouth of Doboy Sound, where low-water depths of from 4 to 7 fathoms are found, the channel in 1868 extended east-southeast between the sand spits forming the shore arms of the bar for a distance

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* Not reprinted. Printed in House Doc. No. 13, Fifty-fifth Congress, first session.

of about 2¼ miles, then divided and crossed the bar in two branches, the northern one having a direction about east by north, with minimum low-water depths of 8 feet, and the southern one extending SE. ½ S. about 1¾ miles and then east by south to sea with minimum low-water depths of 14 feet.

The mean tidal range being about 7 feet, vessels drawing 20 feet were able to cross the bar in calm weather, and it is claimed that on high water of spring tides vessels of 22 feet draft have been taken from the sound to sea.

Two surveys of Doboy Bar have been made since 1868; the first, in the nature of a preliminary examination by me in 1886, and the second and more exhaustive one under my direction during the winter of 1896–97, by Mr. George W. Brown, assistant engineer, whose report is appended hereto.

There are also submitted herewith a map, giving the results of the recent survey, and a comparative chart,* giving, in black, the 12, 15, and 18 foot curves from the last survey; in yellow, the same curves from the survey of 1886, and, in red, those from the survey of 1868.

Between 1868 and 1886 the northern channel across the bar had not changed materially in direction or position, but it had deepened about 2.5 feet. The south or main ship channel had shifted during that same period about 1,000 feet to the south at its outer end, the position of the inner part remaining unchanged. Its depth had decreased about 3 feet.

The survey of 1897 shows the bar to be still moving to the south, the north channel at its seaward end having shifted in that direction about 2,500 feet since 1886. Its depth has not changed sensibly. The distance across the bar in that channel between the inner and outer 18-foot curves has diminished about 4,000 feet during the past thirty years, being now about 7,200 feet.

The south or main channel has moved to the south at its seaward end about 1,000 feet since 1886. The distance across the bar between the inner and outer 18-foot curves, which has not changed materially during that period, is now about 12,200 feet. The depth has diminished about 1 foot. The main channel is divided into two branches, the northern one of which is called the swash channel. Each branch carries about the same depth of water.

In the south or main channel the maximum ebb currents cross the channel in its shoalest part at an angle of about 60°. Those currents are nearly parallel to the swash channel, but cross at wide angles those parts both shoreward and seaward of the swash proper, which areas are slowly shoaling.

The maximum ebb currents are nearly parallel to the north channel.

The material composing the bar is a mixture of fine sand and fragments of shells, and when loosened and thrown into suspension is easily moved. Such material can be handled readily by a hydraulic dredge.

To dredge a channel 300 feet wide and 24 feet deep at high water and following either the swash or main channel would require the removal of about 550,000 cubic yards of material. It is doubtful whether such a channel would remain open any considerable period of time, since both flood and ebb currents cross it at wide angles.

On the accompanying map is shown a proposed channel whose axis is parallel to the strongest ebb currents across Doboy Bar. To dredge a channel 300 feet wide and 24 feet deep at mean high water along that line will require the removal of about 450,000 cubic yards of material.

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*Not printed.

Such a channel would be protected on the north throughout most of its length by a natural training wall known as Chimney Spit. Should it be possible to borrow one of the hydraulic dredges belonging to the United States, the cost of opening the north channel as proposed, including all contingencies, will not exceed $45,000. If no such dredge is available, the cost will be about $70,000. The cost of maintenance is indeterminate.

Unless sufficient funds are provided at one time to complete the improvement, I strongly urge that no work whatever be done.

Respectfully submitted.

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., March 8, 1897.

Respectfully submitted to the Chief of Engineers.

I recently made an inspection of the locality referred to. I concur fully in the views of the district engineer that the improvement will in all probability be temporary, and that, if it should be undertaken at all, it should be done only under an appropriation adequate to its entire completion.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Third indorsement.]

U. S. ENGINEER OFFICE,
Savannah, Ga., March 12, 1897.

Respectfully returned to the Chief of Engineers, United States Army.

Statements of the commerce and navigation interested in Doboy Bar are given in my reports of December 6, 1886 (Appendix N 16, Annual Report of the Chief of Engineers for 1887), and October 5, 1891 (Appendix N 11, Annual Report of the Chief of Engineers for 1892).

I am of opinion that the improvement of Doboy Bar is worthy of being undertaken by the General Government, but only to the extent and under the conditions stated in the within report.

O. M. CARTER,
Captain, Corps of Engineers.

(Through the Division Engineer.)

[Fourth indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., March 13, 1897.

Respectfully returned to the Chief of Engineers.

I concur in the views of the district engineer.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

REPORT OF MR. GEORGE W. BROWN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., February 24, 1897.

CAPTAIN: I have the honor to submit the following report upon a survey of Doboy Bar, Georgia, made in accordance with your instructions of November 16, 1896:

PERIOD OF WORK.

The survey party was organized and left Savannah on November 17, 1896, and went into permanent camp at Cane Creek on the 18th. Gauges were established on the 19th, and on the 20th sounding was begun. The sounding of the bar was completed on January 9, 1897. Other work in connection with the survey was completed on the 12th, and on the 13th the party left Cane Creek.

TIDE GAUGES.

A standard tide gauge was established at its old position on the southwest corner of the mill wharf at Cane Creek, but with its zero at local mean low water from determinations made in 1894; i. e., zero of tide gauge is 7.27 feet below bench mark No. 1 and 10.65 feet below bench mark No. 2 at Cane Creek. From November 19, 1896, to January 13, 1897, this gauge was read at every high water and at every low water, both day and night, and was also read as a check every five minutes when soundings were being taken on the bar. A gauge was also established outside of a creek at a point about 150 feet from low-water line and about 1,000 feet inside of Sapelo Light. On former surveys, as in 1868, the standard gauge at Sapelo Light was placed just inside of the mouth of this creek. This creek had, however, become so short that the tide would not fall much below mean low water. The distance between the point occupied by the gauge in 1868 and the gauge of 1896–97 is only about 600 feet. This gauge was set with its zero at local low water, as determined from a short series of observations made in 1888 and referred to a bench mark on Sapelo Light-house. It was read during sounding, ganging, or boring on Doboy Bar, and for daylight tides when weather permitted. On December 12 a gauge was placed upon an iron pipe driven on Doboy Bar, near the north channel, and about one mile east of the bell buoy. At this gauge we were able to observe only two high waters and two low waters. The gauge was broken down, and an attempt to establish another one on January 5 failed.

During the fifty-five days of observations of tides at Cane Creek much rough weather was experienced, consequently no attempt has been made to compare the results with those obtained from the observations at that point in 1894. The following table shows the results of the gauge readings at Sapelo Light and on the bar, as compared with the standard gauges at Cane Creek:

TABLE NO. 1.

	Standard gauge at Cane Creek.	As compared with Cane Creek gauge.	
		Gauge at Sapelo Light.	Gauge on bar.
	Feet.		
Low-water reading		0.19, mean of 23 tides 0.21, mean of 9 tides *a*	0.34, mean of 2 tides.
Time of low water		8 minutes earlier, mean of 22 tides. 6 minutes earlier, mean of 9 tides. *a*	23½ minutes earlier, mean of 2 tides.
High-water reading	7.05	7.12, mean of 19 tides 7.15, mean of 10 tides *a*	7.18, mean of 2 tides.
Time of high water		12½ minutes earlier, mean of 18 tides. 10½ minutes earlier, mean of 10 tides. *a*	32½ minutes earlier, mean of 2 tides.
Range of tide	7.05	6.98, mean of 21 tides 6.94, mean of 10 tides *a*	6.84, mean of 2 tides.

a These means have been taken of those tides most nearly normal, and can be assumed as correct.

From the above table it appears that Sapelo Light gauge was set 0.21 of a foot too low. It was placed 12.914 feet below bench mark, "a ← in brickwork of window sill on north side of Sapelo Light." The adopted plane of mean low water for this survey at gauges near Sapelo Light is 12.70 feet below the above bench mark.

Too few observations were taken at bar gauge to determine tidal constants at that point, but in all probability the true range and time correspond very closely to the figures given in the foregoing table.

SOUNDINGS.

Soundings were taken and located in the usual manner, the observers being stationed on the balconies of Sapelo and Wolf Island lights. They were made from steamer *Dandy Jim*, except for half a day when that boat was disabled. Casts of the lead were made at regular intervals of time, ten to sixty seconds apart, depending upon depth of water. Range boats with large flags were used to mark the lines on which sounding boat should be run, the rear range being some point of woods or beach at a considerable distance up or down the coast. Successive positions of range boats were determined with a tagged line, but much difficulty was experienced in keeping range boats from drifting from proper position in the stronger currents.

On account of distance of work from shore and the consequent indistinctness of the rear ranges, and at times of its total obliteration, much trouble was experienced in running lines where desired. On several days vision was so indistinct that the boat could not be followed continuously by the instrument men. Some time was lost in being obliged to work on and in vicinity of spits and breakers only at or near high water. The weather was quite unpropitious at times for work of any kind on the bar. Out of fifty-one days, soundings were taken only on sixteen, the other days, except two or three Sundays, being too rough. During the best weather experienced on Doboy Bar quite a heavy ground swell prevailed, rendering the soundings in a measure uncertain. It was intended, however, to work only when the probable error of soundings was within one-half of a foot. The bottom was very "lumpy" except in deep water beyond the bar. Adjacent soundings not in vicinity of a spit differ in places by 4 or 5 feet. Cross lines check as closely as could be expected from so great variation in the lines themselves.

On the survey of the bar 18,700 casts of the lead were made and were located by 6,000 intersections, in just one hundred hours of actual work.

REDUCTION OF SOUNDINGS.

The gauge at Sapelo Light was read continuously during soundings. A correction of —0.2 was applied to the readings to reduce them to local mean low water. (See Table No. 1.) A time correction has also been applied to each sounding, depending upon its distance from the gauge and upon the intervening depth of water. For the propagation of high water (also assumed for the propagation of any given stage of tide) the following formula, deduced by Mr. E. A. Gieseler, assistant engineer, was used: $V=\sqrt{2/3\,gd}$, in which V=velocity of propagation of tides in straight open channels, g=acceleration of gravity, and d=mean depth at high water in feet. From this formula, the tide is propagated through water 15 feet deep at the rate of 1.01 miles in 5 minutes, and through water 35 feet deep at a rate of 1.46 miles in the same time. By results of above formula five zones were laid off on map of platted locations, throughout which corrections of 5, 10, 15, 20, and 25 minutes were applied to the soundings. Soundings taken near sea buoy have been connected by readings of Sapelo gauge taken 25 minutes later, while those near the point of Sapelo Island have been corrected by readings of gauge taken only five minutes later. These corrections correspond with difference in time observed between gauges at the bar and at Sapelo Light.

MAP.

Former surveys of Doboy Bar have been made from the same stations on Sapelo and Wolf Island lights, and the lights have always been assumed to be in the positions shown on the Coast Survey charts. By your instructions I used the same stations, determining the distance between them from the Coast Survey chart to be 13,350 feet. This distance I used, and platted the locations accordingly on a map, the scale of which was supposed to be 800 feet to 1 inch. (See following chapter for corrected distance.) Shore lines, where not shown by sounding locations, have been taken from the Coast Survey chart. The positions of front range beacons and of the buoys were carefully determined at the time of the survey and are shown on the accompanying map.

The smallness of the scale made it impossible to show all of the soundings in the shoaler water. Where sounndings were omitted, only characteristic or shoaler soundings were placed on map. The accompanying map shows soundings taken over a space of about 16 square miles, and shows 12,000 or 13,000 out of the 18,700 soundings taken.

BASE LINE.

Having the time when the weather permitted of no other work, I measured a base line on Commodore Island, from which the distance between the stations on the light-houses was determined. Two independent measurements of base line on different days by different persons varied only 0.08 of a foot in about 4,400 feet; only a small temperature correction was necessary, and the triangles were fairly well

conditioned, so that the resultant distance between the stations should not be largely in error. The distance between the stations occupied I found to be 13,493 feet, and between the lights themselves 13,501 feet. As the map has been platted with a distance of 13,350 feet between stations, it is in error about 1.1 per cent in distance and about 2.2 per cent in area, being that much too small. (See the large diagrams on the accompanying map for positions of stations on light-houses and my letter * of the 19th instant for a discussion of the position of the light-houses themselves.) The azimuth of Wolf Island Light from Sapelo Light, as shown on the accompanying map, is the same as shown on the Coast Survey charts.

CURRENTS.

To determine velocity and direction of currents observations were made at various points on the bar during ebb and flood tides on two different days at about a mean range of tide. Each determination was made with a rod float, a 100-foot tagged line, and either a sextant or a compass. The accompanying map shows the positions from which such measurements were determined and also the direction of such currents at their maximum velocities, the length of each arrow in inches representing the velocity of mean maximum current in feet per second.

It will be seen that in general the flood currents are weak and that they come in from a southerly direction, while the maximum ebb currents are much stronger and run more directly away from the entrance, or at right angles to the coast line. Both ebb and flood currents cross at large angles those portions of the ship channel between the bell buoy and red buoy No. 2 and of the slough or north channel between the red buoy No. 2 and the sea buoy, but are now nearly parallel, particularly the ebb currents, to that portion of the ship channel outside of buoy No. 2, of the swash channel between buoy No. 1 and the channel buoy, and of the north channel inside of buoy No. 2.

BORINGS.

On account of the hardness of the sand on the bar it was found impossible to sink a pipe by force and to obtain from it samples of the bottom. I was able to borrow a hand-brake double-acting pump with hose. This I placed on a raft of square timber, through which I had an opening 8 feet square, surrounded by a frame from which stagings could be placed at heights between 2 and 10 feet. Through this opening I put down a 2-inch pipe, connected to the pump through the hose. The pipe was easily and quickly sunk to any required depth by means of a stream of water forced through it. The pump was then disconnected, a valve dropped into the pipe to a seat at the bottom, and a pump rod with a valve inserted, by means of which a small quantity of bottom material was drawn into the pipe. The pipe was then easily withdrawn by dropping over it the loop of a chain made fast to the frame of the raft, the surging of the raft in the swells affording the power needed. Borings were made near the turn in the ship channel, at buoy No. 2, on the shoal in the swash channel, and at four points in the north or slough channel, it being apparent to me that any considerable improvement which might be made on Doboy Bar would be on or near the latter channel.

The following table shows the materials encountered, samples of which accompany this report. The positions of the borings are shown on the accompanying map.

TABLE NO. 2.—*Borings at Doboy Bar.*

Number of boring.	Depth of water at mean low water.	Depth of sample, mean low water.	Character of material.
	Feet.	*Feet.*	
1	9	9	Hard, fine, light-colored sand, with few fine shells.
	9	18.5	Medium gray sand, with broken shells and mud.
2	14	14	Hard, fine, light-colored sand, with very few fine, broken shells.
	14	19	Dark-gray sand, with small black specks and broken shells.
3	10.5	10.5	Hard, fine, light-colored sand, with few fine shells.
	10.5	15	Gray sand, with fine, broken shells.
4	9	9	Hard, light-gray, fine sand.
	9	18.5	Gray sand.
	9	22	Very fine, gray, muddy sand, with few fine, broken shells.
5	14.5	14.5	Sand and mud, very hard and sticky.
	14.5	20.5	Medium, fine, light-colored sand, with broken shells and mud.
	14.5	24	Very fine, gray, muddy sand, with small shells.
6	11	11	Hard, fine, white sand.
	11	15	Medium, fine, gray sand, with mud and few fine shells.
	11	21	Very fine, gray sand, with broken shells and few lumps of mud.

*Not received.

In general, except at buoy No. 2 of ship channel, the bottom consists of fine sand, light in color and very hard, with very few shells. Lower down mud and a greater percentage of shells are found with the sand, but at all places the material is such as would easily be handled with a suction dredge, particularly that in the vicinity of the north channel.

BOTTOM.

At other places than at the position of the borings the lead line showed the bottom to be of sand and hard except in the deeper pockets of the bar, where it may be soft or sticky. As a rule the shoals are hard. Character of bottom is shown on accompanying map.

CHANNELS.

Doboy Bar pilots now use for deepest drafts the main buoyed ship channel, which parallels at its outer end or almost follows the range of the Wolf Island beacons to a point near the range of the Sapelo beacons. From near the intersection of the two ranges inward the channel follows the line of buoys Nos. 2, 4, 1 and the bell buoy. This channel affords 10½ feet at its shoalest point (which is near buoy No. 4) at mean low water. The swash channel is a cut-off from the main ship channel, leaving the same on coming in at the channel buoy and running directly to buoy No. 1, also on a line with the center of Doboy Island. At buoy No. 1 it joins the main ship channel. The swash channel affords the same water, i. e., 10½ feet at mean low water, in its shoalest part. This channel is used by towboats, but seldom by loaded vessels, not having, as in the ship channel, a buoy to mark the exact position of the shoalest water. A north or slough channel, as it is locally called, is marked by the bell buoy (branching from main channel at this point); a small red buoy, also marked No. 2, and an unmarked channel buoy serving as a sea buoy for that channel, and located about 2¾ miles north 18° west of the sea buoy D of main ship channel. The north channel carries about 9½ feet of water at mean low water in its shoalest part, but by running directly out to sea on line of the bell buoy and buoy No. 2 about 10½ feet of water at mean low water could be carried across the shoal of the bar.

BEACONS.

For the position of range beacons see my letter to you of the 19th instant. The four range beacons are shown on the accompanying map in their relative positions. They form two ranges, the Wolf Island range practically marking the channel from sea buoy D to buoy No. 2. The intersection of this range with the Sapelo range marks a position from which buoy No. 2 can be picked up about 400 feet to the northwest. The Sapelo range is only used further to show approximately the general positions of buoys No. 4 and No. 2, and a line on which buoy No. 6 can be picked up.

CHANGES.

Accompanying this report is a map on tracing paper showing at once the 12-foot, 15-foot, and 18-foot contours; the channel lines and the buoys of the survey made by the United States Coast Survey in 1868; of the survey made by yourself in 1886, and of the present survey. Among the more marked changes are the following: The Knuckles, marked by the bell buoy, have pushed seaward, and with it the bell buoy has been shifted outward about 1,400 feet. Much of this change has taken place within the past ten years. The north breaker has encroached upon the ship channel, forcing it about a quarter of a mile to the southward and nearly as much to the westward at buoy No. 2. With the bell buoy shifted about a quarter of a mile to the east and buoy No. 2 about as far to the west, the channel between those two points runs much more squarely across the bar than formerly, and in a position much less apt to be self-maintaining.

This channel in its position of 1868 carried about 16 feet of water at mean low water, whereas now, in its present and best position, it carries only about 10½ feet. The 18-foot curve beyond the bar adjacent to the ship channel, particularly to the northward, lies much nearer shore than in 1868, showing marked deepening. The north channel has moved, at the red buoy, about 1,600 feet to the south of its position in 1868, without bettering very much its depth. But it is in this vicinity that the most marked changes have taken place. On the line of the north channel of 1868 the 18-foot curve, from deep water inside, has pushed outward about 3,700 feet, the 15-foot curve about 1,400 feet, and the 12-foot curve about 2,500 feet. Beyond the bar those curves remain about where they were in 1868, though some filling seems to have taken place since 1886. A marked deepening is also shown just south of the present buoy No. 2 of this channel, where the water is 3 or 4 feet deeper over a large area than in 1886 and 6 or 7 feet deeper than in 1868. It is probable that within thirty years more deepening has taken place to the south than to the north of the

present position of the shoal marked by buoy No. 2. A notable shoal has formed beyond the channel to the northwest of the bell buoy. Where the sand now shows at low water on the tail of Chimney Spit there was in 1868 from 20 to 27 feet of water at low water over an area nearly a mile long by about one-fourth of a mile wide in the widest part. Just outside of this, however, a large point of the old shoal has been cut away, thus straightening the shoal as marked by the 12-foot, 15-foot, and 18-foot curves on the north side of the deep water from near the Sapelo Beach almost out to buoy No. 2.

I have the honor to transmit with this report:

(*a*) Map of survey of Doboy Bar; 1 inch equals 800 feet.

(*b*) Map of same, showing changes from 1868 to 1897; tracing paper; 1 inch equals 800 feet.

(*c*) Nineteen notebooks.*

(*d*) Eleven samples of materials.

Very respectfully, your obedient servant,

GEO. W. BROWN, *Assistant Engineer.*

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

*Omitted.

APPENDIX O.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN FLORIDA.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. St. Johns River, Florida.
2. Volusia Bar, Florida.
3. Ocklawaha River, Florida.
4. St. Augustine Harbor, Florida.
5. Indian River, Florida.
6. Northwest Entrance, Key West Harbor, Florida.
7. Caloosahatchee River, Florida.
8. Charlotte Harbor and Pease Creek, Florida.
9. Sarasota Bay, Florida.
10. Manatee River, Florida.
11. Withlacoochee River, Florida.
12. Suwanee River, Florida.
13. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

14. Jupiter Inlet, Florida.
15. Orange and Caloosahatchee rivers, Florida.
16. Inside passage from Punta Rassa to Charlotte Harbor, Florida.
17. Hillsboro Bay and River, Florida.
18. Clearwater Harbor, Florida.
19. Crystal River, Florida.
20. Harbor at Cedar Keys, Florida.

SURVEYS.

21. Palmbeach, Florida.
22. Biscayne Bay, Florida.
23. Tampa Bay, Florida.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., July 20, 1897.

GENERAL: I have the honor to transmit herewith reports upon the works of river and harbor improvement under my charge for the fiscal year ending June 30, 1897.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

O 1.

IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1305 to 1312, Report of the Chief of Engineers for 1896, and to pages 1586 to 1604, Report of the Chief of Engineers for 1895, the

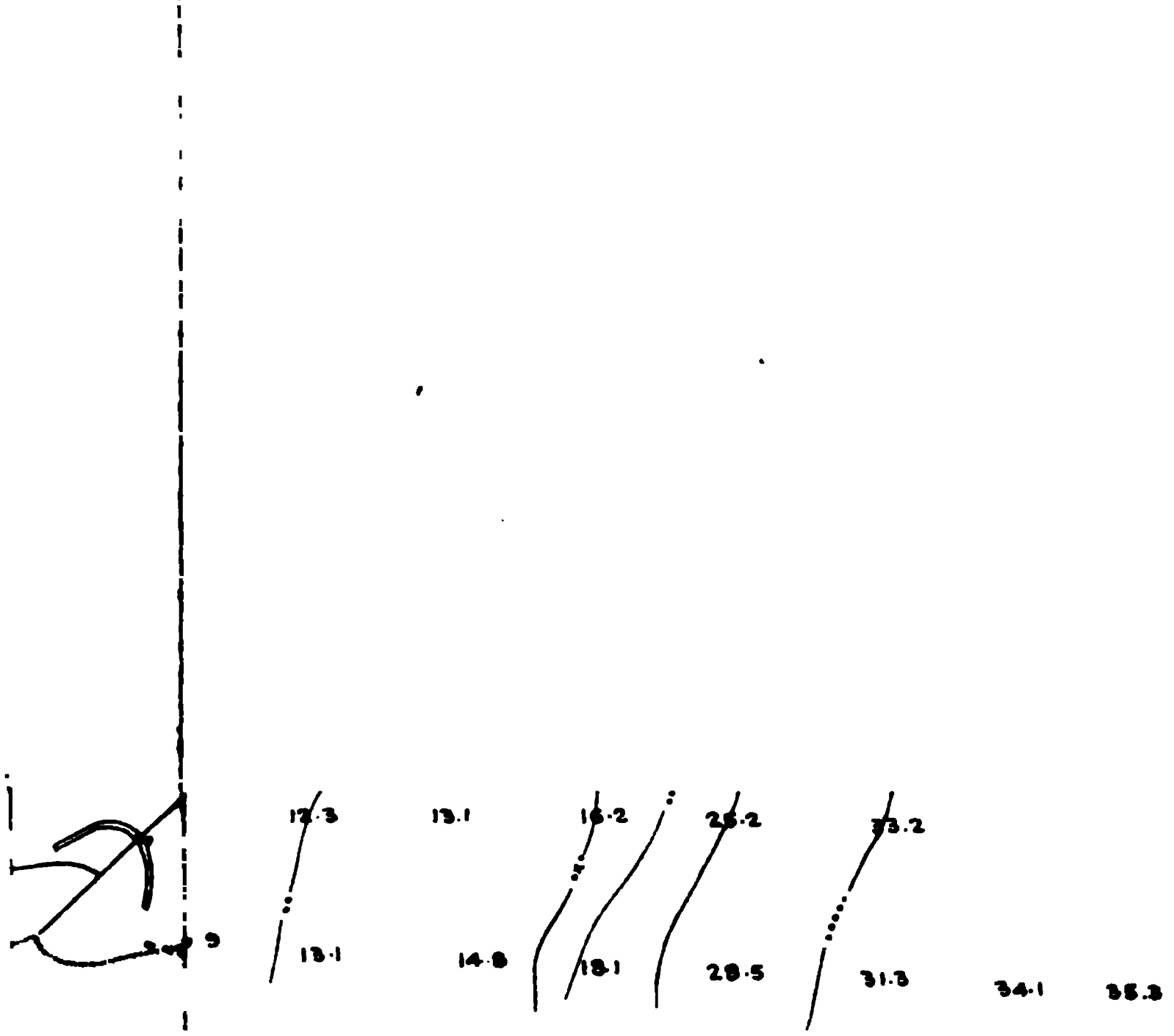
latter being a report upon a survey of St. Johns River, Florida, from Jacksonville to the ocean with a view of securing a 24-foot channel.

It was decided to expend $150,000 of the sum of $200,000 appropriated in the river and harbor act of June 3, 1896, in raising the south jetty to the mean height of the water at the beginning of ebb flow from the present end of the concrete coping at Station 1260 to about Station 8000, and such other work upon the jetties at the mouth of the river as that amount would permit. After due advertisement bids for doing the work by contract were opened December 16, 1896. Mr. R. G. Ross, of Jacksonville, Fla., was the lowest bidder and was awarded the contract. The amount bid was $2.64 per ton for first-class stone and $2.24 per ton for second-class stone in place upon the jetties. The contract was entered into January 2, 1897, and work begun March 18, 1897. At the end of the fiscal year a total of 21,917.05 tons of first-class stone and 213.36 tons of second-class stone had been placed upon the south jetty, building it up to the desired height between Stations 1700 and 4700 and between Stations 7200 and 8200.

A survey was made of the entrance to the river between June 1 and 21, the map of which is submitted herewith. A comparison of this map with that of the survey of last year shows a decided improvement in the available channel depth across the bar. Last year the distance between the 15-foot contours inside and outside the bar was 900 feet. This year, with the exception of two places, one 50 feet and the other 100 feet across, where a depth of 14¾ feet is found, there is a depth of 15 feet and more entirely across the bar. The shoal forming the crest of the bar has advanced seaward a distance of between 200 and 300 feet. The extensive shoal lying inside of the north jetty and contiguous thereto has increased in size and has encroached upon the channel so that opposite Station 3000 of the south jetty the channel is some 200 feet narrower than it was last year. This movement has been noticeable from year to year for some time past. Now that the low place in the south jetty in that vicinity has been raised, this contraction of the channel will probably cease. The width between the 24-foot contours at this place is in excess of 500 feet, which is ample.

A recent examination of the dredged channel in the river above the mouth showed that the cuts dredged at Dames Point, St. Charles Creek, and Browns Creek have maintained their width and depth very well. In the two latter an appreciable deepening has taken place. In the case of Browns Creek Cut a slight deposit was noticeable at the lower end, the probable result of the scour above. At the Cedar Creek and Mile Point cuts a very considerable shoaling seems to have taken place, more at the latter than at the former. The volume of the sand which has been deposited in these cuts has not as yet been definitely ascertained. The depth, however, is known to be no greater than at present exists upon the bar at the mouth. The necessity for the extension and building up of the training wall at Cedar Creek Cut and the construction of a training wall at Mile Point Cut is beyond question in the light of recent developments. In the preparation of the estimate for a 24-foot channel from the ocean to Jacksonville, the cost of this latter work was not included. As the cost will be a considerable amount, the estimate will, no doubt, need to be increased.

The sum of $50,000 was reserved from the appropriation of $200,000 made in act of June 3, 1896, for the purpose of dredging the bar at the mouth, should such work prove to be advisable. In the light of past experience it does not appear expedient to undertake dredging upon this bar, exposed as it is to violent wave action and strong cross currents during northeast storms, until the north jetty has been built up



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and extended so that it will protect the dredged channel from these deleterious influences.

The importance to commerce of securing a 24-foot channel from the ocean to Jacksonville can not well be overestimated, and the work should be vigorously carried to completion. In order to do this with economy the improvement should be conducted under the continuous contract system, and the sum of $500,000 could be profitably expended each year until completion.

Money statement.

July 1, 1896, balance unexpended		$200,476.32
June 30, 1897, amount expended during fiscal year		35,974.74
July 1, 1897, balance unexpended		164,501.58
July 1, 1897, outstanding liabilities	$19,323.15	
July 1, 1897, amount covered by uncompleted contracts	85,412.08	
		104,735.23
July 1, 1897, balance available		59,766.35
Amount (estimated) required for completion of existing project		1,909,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		500,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

Appropriations for improvement of St. Johns River, Florida.

June 14, 1880	$125,000	September 19, 1890	$170,000
March 3, 1881	100,000	July 13, 1892	112,500
August 2, 1882	150,000	March 3, 1893	284,500
July 5, 1884	150,000	June 3, 1896	200,000
August 5, 1886	150,000		
August 11, 1888	175,000	Total	1,617,000

Abstract of proposals for furnishing stone on jetties at mouth of St. Johns River, Florida, received and opened on December 16, 1896, in response to advertisement dated November 16, 1896.

No.	Name and address of bidder.	First-class stone (per ton).	Second-class stone (per ton).
1	Charles C. Smith & Son, Washington, D. C	$3.73	$2.38
2	Harry L. Babbitt, Jacksonville, Fla	3.42	2.20
3	Owen Patterson, Baltimore, Md	6.50	5.50
4	Venable Construction Co., Atlanta, Ga	3.40	3.40
5	R. G. Ross, Jacksonville, Fla	2.64	*a* 2.24
6	George A. De Cottes, Jacksonville, Fla	3.90	2.30
7	Stewart Contracting Co., Columbia, S. C	3.20	2.55
8	John L. Grim, Philadelphia, Pa	3.83	2.20
9	J. Friday & Son, Pittsburg, Pa	3.95	2.30
10	Charles Clarke & Co., Galveston, Tex	4.00	2.80

a Accepted.

Contract in force during the fiscal year.

Name of contractor.	Contract.	Date approved.	Date of beginning.	Date of expiration.
R. G. Ross	Jetty construction	Jan. 12, 1897	Feb. 1, 1897	Dec. 1, 1897

COMMERCIAL STATISTICS.

Commerce of St. Johns River, Florida, during the year ending December 31, 1896.

[Furnished by Charles R. Bisbee, collector of customs, district of St. Johns.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Cotton	1,740	$311,520	Pineapples	201	$12,000
Fertilizers	2	35	Phosphate rock	702	7,020
Fruits	91	30,103	Naval stores	2,104	31,425
Grain	13	326	Vegetables	345	30,960
Hides	2	330	Tobacco, cigars	20	20,000
Honey, sirup, etc	9	541	Hay	1	10
Lumber	192,000	1,651,000	Wool	511	22,300
Cross-ties	21,072	116,577	Shingles	4,563	357,000
Merchandise	4,000	1,000,000			
Orange-box material	81	30,000	Total	227,457	3,621,147

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	140	280,412	132	281,228
Sailing vessels	226	77,334	230	77,883
Yachts	12	1,200	12	1,200
Total	378	358,946	374	360,311

Estimated number of passengers carried by water		15,600
Estimated total trade of neighborhood carried by water	per cent	75
Probable increase of trade were improvement completed	do	100

O 2.

IMPROVEMENT OF VOLUSIA BAR, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to the Annual Report of the Chief of Engineers for 1896, pages 1313 and 1314.

The sum of $1,000 was appropriated for this improvement in act of August 17, 1894. This amount was inadequate for any portion of the work required and was not expended until an additional appropriation of the same amount was made in act of June 3, 1896, when preparations were made to undertake the work, which was urgently needed. After due advertisement a contract was entered into August 19, 1896, with the Florida Dredging Company for dredging at the rate of 43 cents per cubic yard. Dredging began September 10 and was finished October 11, 1896. The total amount of material removed was 4,242 cubic yards. This work has resulted in the formation of a channel having a least width of 80 feet and from 6 to 7 feet deep, connecting the 6-foot contours on each side of the shoal. The total length of the area dredged was 940 feet; 570 feet of this is 80 feet wide, 50 feet 50 feet wide, and 320 feet 35 feet wide.

An appropriation of $2,000 is required each year to keep the bar in a navigable condition.

This work is in the collection district of St. Johns. Jacksonville is the nearest port of entry. Nearest light-house is Volusia Bar Light. Nearest fort is Fort Marion.

Money statement.

July 1, 1896, balance unexpended	$2,209.09
June 30, 1897, amount expended during fiscal year	2,209.09
Amount that can be profitably expended in fiscal year ending June 30, 1899, for maintenance	2,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriations for improvement of Volusia Bar, Florida.

June 14, 1880	$5,000	September 19, 1890	$500
March 3, 1881	5,500	July 13, 1892	1,000
August 2, 1882	5,000	August 17, 1894	1,000
July 5, 1884	2,000	June 3, 1896	1,000
August 5, 1886	7,500		
August 11, 1888	500	Total	29,000

Abstract of proposal for dredging at Volusia Bar, Florida, received in response to circular advertisement dated July 23, 1896, and opened August 1, 1896.

Name and address of bidder.	Estimated quantity.	Price per cubic yard.	Total.
	Cubic yards.	*Cents.*	
Florida Dredging Co., Jacksonville, Fla	8,000	43	$3,440

Contract in force during the fiscal year.

Name of contractor.	Contract.	Date approved.	Date of beginning of work.	Date of expiration.
Florida Dredging Co	Dredging	Aug. 27, 1896	Sept. 17, 1896	Nov. 17, 1896

COMMERCIAL STATISTICS.

Commerce of Volusia Bar, Florida, during the year ending December 31, 1896.

[Furnished by Clyde's St. Johns River Line.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Fertilizers	1,388	$48,580	Oranges	28	$30,000
Fruit	143	11,174	Pineapples	39	1,950
Grain	1,143	28,860	Vegetables	785	102,050
Hides	6	660	Fish and oysters	118	8,850
Lumber:			Tobacco	65	52,650
Rough	21	504	Hay	898	17,960
Dressed	30	1,050			
Merchandise	2,717	1,910,768	Total	7,681	2,215,056

Arrivals and departures of vessels for the year ending December 31, 1896.

Steamers, number of times crossing the bar	392
Estimated number of passengers carried by water	14,876
Estimated total trade of neighborhood carried by water, per cent	15
Probable increase of trade were improvement completed, do	400

O 3.

IMPROVEMENT OF OCKLAWAHA RIVER, FLORIDA.

For a description of the locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained see pages 1314 to 1316, Report of the Chief of Engineers for 1896.

There were no operations during the past fiscal year. It is proposed to expend the appropriation of $3,000, made in the act of June 3, 1896, in maintaining the improvement along that portion of the river already worked over by the removal of such snags and overhanging trees as have become obstructions during the cessation of work.

The sum of $15,000 still remaining unappropriated of the amount estimated to complete the existing project, in addition to $2,000 required for maintenance, could be profitably expended during the fiscal year ending June 30, 1899.

The Ocklawaha River is in the collection district of St. Johns. The nearest lighthouse is the St. Augustine Light. The nearest fort is Fort Marion, Fla.

Money statement.

July 1, 1896, balance unexpended	$3,045.83
June 30, 1897, amount expended during fiscal year	45.83
July 1, 1897, balance unexpended	3,000.00
Amount (estimated) required for completion of existing project	15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899, including maintenance	17,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriations for improvement of Ocklawaha River, Florida.

September 19, 1890	$10,000
July 13, 1892	1,000
August 17, 1894	3,000
June 3, 1896	3,000
Total	17,000

COMMERCIAL STATISTICS.

Commerce of Ocklawaha River, Florida, during the year ending December 31, 1896.

[Furnished by R. J. Adams.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cotton and wool	1	Merchandise	439
Fertilizers	17	Vegetables	35
Fruits	2	Hay	42
Grain	175	Naval stores	3,871
Hides	1		
Honey, sirup, etc	12	Total	4,109
Lumber	14		

Millions of feet of cypress timber are being taken out by different parties.

Arrivals and departures of vessels for year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	160	4,800	160	4,800

Estimated number of passengers carried by water 12,000
Estimated total trade of neighborhood carried by water .....per cent.. 50
Probable increase of trade were improvement completed .....do.... 100

O 4.

IMPROVEMENT OF ST. AUGUSTINE HARBOR, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained see pages 1316 and 1317, Report of the Chief of Engineers for 1896.

The amount appropriated by the river and harbor act of August 17, 1894, being inadequate to construct the new work designed, is still held in reserve for emergencies that may arise as a result of storms or until additional appropriation is made. The erosion of the shore line along the inner sides of the entrance still continues. To undertake to prevent this erosion with much prospect of success a greater expenditure than the funds available will permit of would be required.

St. Augustine Harbor is in the collection district of St. Augustine, which is the nearest port of entry. Nearest fort is Fort Marion. The St. Augustine Light is the nearest light-house.

Money statement.

July 1, 1896, balance unexpended	$6,074.16
June 30, 1897, amount expended during fiscal year	74.06
July 1, 1897, balance unexpended	6,000.10
Amount (estimated) required for completion of existing project	24,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.

Appropriations for improvement of St. Augustine Harbor, Florida.

August 11, 1888	$35,000
September 19, 1890	20,000
July 13, 1892	10,000
August 17, 1894	6,000
Total	71,000

COMMERCIAL STATISTICS.

Commerce of St. Augustine Harbor, Florida, during the year ending December 31, 1896.

[Furnished by Joseph F. Canova, deputy collector of customs.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Fertilizers	2	$90.00	Hay	1	$18.00
Fruits	10	169.50	Shingles	25	198.00
Grain	1	16.00	Shells	2	20.00
Lumber, rough	61	366.00			
Merchandise	100	1,575.00	Total	203	2,415.00
Oranges	1	22.50			

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	2	475	2	475
Sailing vessels	6	396	6	396
Yachts	10	250	10	250
Total	18	1,121	18	1,121

Estimated number of passengers carried by water ..... None.
Estimated total trade of neighborhood carried by water ..... per cent.. 1

O 5.

IMPROVEMENT OF INDIAN RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1318 to 1320, Report of the Chief of Engineers for 1896.

No funds being available, there was no work done on the river proper between Goat Creek and Jupiter Inlet during the last fiscal year.

Negro Cut.—Dredging at Negro Cut, Indian River Inlet, by the U. S. dredge *Suwanee* began January 9, 1896, and the channel required by the project, 100 feet wide and 6 feet deep, was completed September 26, 1896. During the month of August work was suspended, owing to excessive heat and the ill health of the crew. The amount of material removed during the fiscal year ending June 30, 1896, was 23,097 cubic yards, which, with the amount removed during the previous fiscal year, makes a total of 93,583 cubic yards.

The river and harbor act of June 3, 1896, contained the following item: "Improving Indian River, Florida: By dredging channel at Negro Cut, near Indian River Inlet, seven thousand five hundred dollars."

In submitting the estimate for this improvement the cost of the construction of a training wall to protect the dredged channel was included. The dredging having been completed it was proposed to proceed with the construction of the training wall, but under a decision of the Comptroller of the Treasury such an application of the funds available is not permissible without action of Congress.

Jupiter Inlet.—The project for the expenditure of the sum of $500 appropriated by act of February 26, 1896, was approved August 19, 1896. This provided for making an opening through the sand ridge, which closed the inlet, 40 feet wide on the bottom and 2 feet deep at low water. An agreement was entered into with Mr. F. M. Cabot, a resident of the vicinity of the inlet, August 31, 1896, to do the work required under the project for the amount of money appropriated, $500. Work began September 5, and was satisfactorily completed by September 19, 1896. As was expected, under the natural erosion of the water the opening rapidly enlarged. On December 26, 1896, the opening was reported as being 100 feet wide and 3 feet deep at low water at shoalest places. Following the natural tendency of such channels along this coast, the opening is working southward, and in the course of time some violent storm will close it again.

The improvement of Indian River between Goat Creek and Jupiter Inlet is of sufficient importance to warrant that it be rapidly completed. The balance, $29,000, of the estimate for completing the project could be profitably expended during the fiscal year ending June 30, 1899.

The recommendation made in last Annual Report for the construction of a new combined dredge and snag boat to replace the *Suwanee* for use on this and other rivers and harbors in Florida is again renewed. (See report on Manatee River.)

Indian River is in the collection district of St. Augustine, which is the nearest port of entry. The nearest fort is Fort Marion. Jupiter Light is the nearest light-house.

Money statements.

INDIAN RIVER BETWEEN GOAT CREEK AND JUPITER INLET.

Amount (estimated) required for completion of existing project.....	$29,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	29,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

NEGRO CUT, INDIAN RIVER INLET.

July 1, 1896, balance unexpended.....	$15,593.46
June 30, 1897, amount expended during fiscal year.....	6,193.97
July 1, 1897, balance unexpended.....	9,399.49
July 1, 1897, outstanding liabilities.....	600.00
July 1, 1897, balance available.....	8,799.49

JUPITER INLET.

July 1, 1896, balance unexpended.....	$500.00
June 30, 1897, amount expended during fiscal year.....	500.00

Appropriations for improvement of Indian River, Florida.

July 13, 1892 (between Goat Creek and Jupiter Inlet).....	$15,000
August 17, 1894 (Negro Cut).....	5,000
March 2, 1895 (Negro Cut).....	15,000
February 26, 1896 (Jupiter Inlet).....	500
June 3, 1896 (Negro Cut).....	7,500
Total.....	43,000

COMMERCIAL STATISTICS.

No commercial statistics for this river are given. Persons interested in the matter were requested to furnish them, but they have not done so.

O 6.

IMPROVEMENT OF NORTHWEST ENTRANCE, KEY WEST HARBOR, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, see pages 1325 to 1327, Report of the Chief of Engineers for 1896.

The investigations attending the preparation of a project for the expenditure of the appropriation of $80,000, made in act of June 3,

1896, indicated the advisability of commencing the construction of the west jetty, which was decided upon. In selecting a site for this jetty two important considerations, more or less in conflict, presented themselves. It was, of course, desirable to so locate the jetty that it would have the most favorable influence upon the prevailing currents and protect the channel from heavy wave action as far as practicable, but at the same time due care must be exercised in order that nothing be done that would interfere with the proper development of the proposed channel along the line of the buried rock channel that was discovered during the survey of 1889. A careful survey of the locality, having special reference to the development of the rock contours, was accordingly undertaken. Owing to inclement weather this survey was not completed until February, 1897. A location for the jetty was recommended, and an estimate of the cost submitted March 6, 1897. This was approved by the Department March 24 so far as the expenditure of the appropriation of $80,000, made by act of June 3, 1896, was involved.

After due advertisement, bids for doing the work proposed by contract were opened June 4, 1897. The bid of Mr. R. G. Ross, of Jacksonville, Fla., at $1.57 per ton for coral limestone, was the lowest and was accepted. The contract was executed June 25, 1897, and forwarded to the Department for approval. Under the terms of the contract work is to commence August 15, 1897, and be completed June 15, 1898.

No recent survey of the channel across the bar has been made, but it is believed that there has been no appreciable change either in its location or available depth.

The northwest channel is of very great importance, affording as it will when the project for its improvement is completed a short cut for deep draft vessels entering and departing from Key West. The work should be pushed forward as rapidly as practicable, and with this end in view it is recommended that $225,000 be made available for the work during the fiscal year ending June 30, 1899.

The harbor at Key West is in the collection district of Key West, Fla., which is the nearest port of entry. Nearest light-house is the Northwest Passage Light. Nearest fort is Fort Taylor, Fla.

Money statement.

July 1, 1896, balance unexpended		$83,265.91
June 30, 1897, amount expended during fiscal year		8,088.17
July 1, 1897, balance unexpended		75,177.74
July 1, 1897, outstanding liabilities	$43.40	
July 1, 1897, amount covered by uncompleted contracts	70,000.00	
		70,043.40
July 1, 1897, balance available		5,134.34
Amount (estimated) required for completion of existing project		225,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		225,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

Appropriations for improvement of Northwest Entrance, Key West Harbor, Florida.

August 11, 1888	$25,000
September 19, 1890	40,000
July 13, 1892	75,000
August 17, 1894	80,000
June 3, 1896	80,000
Total	300,000

Abstract of proposals for furnishing stone in place on line of west jetty at Northwest Entrance, Key West Harbor, Florida, received in response to advertisement dated May 5, 1897, and opened June 4, 1897.

No.	Name and address of bidder.	Amount bid per ton.
1	Samuel H. Venable, Atlanta, Ga	$3.44
2	Stewart Contracting Co., Columbia, S. C	2.45
3	Walter S. Friday and Emil L. Friday, Charleston, S. C	1.95
4	R. G. Ross, Jacksonville, Fla	a 1.57

a Accepted.

Contract in force during the fiscal year.

Name of contractor.	Contract.	Date approved.	Date of beginning of work.	Date of expiration.
R. G. Ross	Jetty construction	(a)	Aug. 15, 1897	Jan. 15, 1898

a Submitted for approval June 30, 1897.

COMMERCIAL STATISTICS.

Commerce of Key West, Fla., during the year ending December 31, 1896.

[Furnished by Jefferson B. Browne, collector of customs.]

Articles.	Gross tonnage (estimated).	Value (estimated).	Articles.	Gross tonnage (estimated).	Value (estimated).
Cigars	400	$3,500,000	Pineapples	1,900	$38,000
Cattle	1,070	97,000	Vegetables	1,824	95,400
Fruits	2,300	52,000	Ship stores	1,150	130,000
Grain	1,000	28,000	Fish and oysters	1,060	20,000
Hides	200	8,000	Tobacco	557	480,294
Sirup, etc	20	400	Sponges	120	470,000
Lumber	3,350	24,000			
Merchandise	30,582	3,040,000	Total	45,053	7,985,094
Oranges	20	2,000			

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	389	456,109	403	365,249
Sailing vessels	145	26,947	129	23,467
Yachts	3	212	.....	.....

Estimated number of passengers carried by water 45,762
Estimated total trade carried by water ..... per cent.. 100

Trade would probably be enormously increased if improvement were completed, as the entire trade of the Gulf of Mexico would pass through the Northwest Passage instead of going around the dangerous reefs of the Tortugas.

O 7.

IMPROVEMENT OF CALOOSAHATCHEE RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1327 and 1328, Report of the Chief of Engineers, for 1896.

It is proposed to expend the appropriation of June 3, 1896, for maintenance, in removing such snags and overhanging trees as have become obstructions during the cessation of work, in dredging the shoals where less than the required depth is found, and in reestablishing such channel marks as may be necessary, so soon as the services of the United States snag boat *Suwanee* become available.

For recommendation for the construction of a new combined dredge and snag boat for use on this and other rivers and harbors of Florida, see report on Manatee River.

An appropriation of $1,000 annually or $2,000 biannually will be required to keep the river in a fair navigable condition.

Caloosahatchee River is in the collection district of Key West, which is the nearest port of entry. The nearest light-house is Sanibel Light, and the nearest fort is Fort Taylor, Fla.

Money statement.

July 1, 1896, balance unexpended	$1,707.75
July 1, 1897, balance unexpended	1,707.75
July 1, 1897, outstanding liabilities	14.04
July 1, 1897, balance available	1,693.71
Amount that can be profitably expended for maintenance in fiscal year ending June 30, 1899. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	2,000.00

Appropriations for improvement of Caloosahatchee River, Florida.

August 2, 1882	$5,000	July 13, 1892	$1,000
July 5, 1884	5,000	August 17, 1894	2,000
August 5, 1886	4,000	June 3, 1896	1,000
August 11, 1888	10,000		
September 19, 1890	3,600	Total	31,600

COMMERCIAL STATISTICS.

Commerce of Caloosahatchee River, Florida, for the year ending December 31, 1896.

[Furnished by F. A. Hendry and the merchants, cattlemen, and fruit growers of Lee County, Fla.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Cattle	35,000	$120,000	Pineapples	200	$20,000
Fertilizers	1,000	40,000	Vegetables	8,750	150,000
Fruits	300	10,000	Fish and oysters	100	4,000
Grain	1,800	36,000	Tobacco	1	1,000
Hides	250	8,000	Hay	200	8,000
Honey, sirup, etc	50	5,000	Lumber, rough	8,000	8,000
Merchandise	20,000	600,000			
Oranges	1,400	75,000	Total	67,051	1,127,000

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	1,015	50,750	1,015	50,750
Sailing vessels	300	12,000	300	12,000
Yachts	100	500	100	500

Estimated number of passengers carried by water		15,000
Estimated total trade of neighborhood carried by water	per cent	95
Probable increase of trade were improvement completed	do	100

O 8.

IMPROVEMENT OF CHARLOTTE HARBOR AND PEASE CREEK, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1329 and 1330, Report of the Chief of Engineers for 1896.

With the appropriation of $20,000 made by the river and harbor act of June 3, 1896, it is proposed to improve the channel over Cape Haze Shoal, to widen the dredged channel leading to the wharves, and to remove such shoals as may have formed in the channel previously dredged.

It having been decided to do the work by contract, proposals were solicited, the bids to be opened March 10, 1897. Only one bid was received, that of Mr. J. A. Bryan, of Jacksonville, Fla., who proposed to do the dredging required at the rate of 29 cents per cubic yard. The bid was accepted and a contract was entered into March 27 and approved April 16, 1897. Dredging began April 26 and was continued until June 26, when work was temporarily suspended, owing to an accident to the boiler of the dredge. At the end of the fiscal year a total of 15,173 cubic yards of material had been removed under this contract.

It is estimated that $25,000 can be profitably expended upon this work during the fiscal year ending June 30, 1899.

Charlotte Harbor is in the collection district of Key West, and Punta Gorda is the nearest port of entry; nearest light-house is Gasparilla Light, and the nearest fort is Fort Taylor, Fla.

Money statement.

July 1, 1896, balance unexpended		$21,043.16
June 30, 1897, amount expended during fiscal year		3,107.21
July 1, 1897, balance unexpended		17,935.95
July 1, 1897, outstanding liabilities	$2,531.42	
July 1, 1897, amount covered by uncompleted contracts	13,029.76	
		15,561.18
July 1, 1897, balance available		2,374.77
Amount (estimated) required for completion of existing project		25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		25,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriations for improvement of Charlotte Harbor and Pease Creek, Florida.

September 19, 1890	$35,000
August 17, 1894	20,000
June 3, 1896	20,000
Total	75,000

Abstract of proposal for dredging Charlotte Harbor, Florida, received in response to advertisement dated February 10, 1897, and opened March 10, 1897.

Name and address of bidder.	Price per cubic yard.	Remarks.
	Cents.	
James A. Bryan, Jacksonville, Fla	29	Accepted.

Contract in force during the fiscal year.

Name of contractor.	Contract.	Date approved.	Date of beginning of work.	Date of expiration.
James A. Bryan	Dredging	Apr. 10, 1897	Apr. 15, 1897	Oct. 15, 1897

COMMERCIAL STATISTICS.

Commerce of Charlotte Harbor and Pease Creek, Florida, during the year ending December 31, 1896.

[Furnished by A. W. Gilchrist, Punta Gorda, Fla.]

Names of articles.	Gross tonnage.	Estimated value.	Names of articles.	Gross tonnage.	Estimated value.
Cattle	100	$5,000	Phosphate, pebble	74,841	$748,410
Fertilizers	100	3,000	Vegetables	200	60,000
Grain	1,500	30,000	Fish and oysters	12,879	73,377
Honey, sirup, etc	50	2,500	Tobacco	2	4,500
Lumber	2,500	30,000	Hay	250	4,700
Merchandise	2,000	100,000			
Oranges	500	20,000	Total	95,122	1,099,487
Pineapples	200	8,000			

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	405	115,790	405	115,790
Sailing vessels	40	20,626	40	20,626
Yachts	20	550	20	550
Total	465	136,966	465	136,966

Estimated total trade of neighborhood carried by water.....per cent.. 70
Probable increase of trade were improvement completed.....do..... 140

O 9.

IMPROVEMENT OF SARASOTA BAY, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained attention is invited to the Report of the Chief of Engineers for 1896, pages 1331 and 1332.

There were no operations during the fiscal year, as the U. S. dredge *Suwanee* has not been available for the work. The dredge is now undergoing repairs and work will be resumed at this place during the course of the next few months.

The construction of a new dredge and snag boat for use on this and other improvements in Florida is recommended to replace the *Suwanee*. (See report on Manatee River.)

Sarasota is in the collection district of Tampa, which is the nearest port of entry. Nearest light-house is Egmont Key Light. Nearest fort is Fort Taylor, Key West, Fla.

Money statement.

July 1, 1896, balance unexpended	$2,501.57
July 1, 1897, balance unexpended	2,501.57
July 1, 1897, outstanding liabilities	215.14
July 1, 1897, balance available	2,286.43
Amount (estimated) required for completion of existing project	42,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	42,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriations for improvement of Sarasota Bay, Florida.

September 19, 1890	$5,000
July 13, 1892	2,500
August 17, 1894	2,500
June 3, 1896	2,500
Total	12,500

COMMERCIAL STATISTICS.

Commerce of Sarasota Bay, Florida, during the year ending December 31, 1896.

[Furnished by J. Hamilton Gillespie, Sarasota, Fla.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Cattle	250	$10,000	Merchandise	1,000	$40,000
Fertilizers	50	2,000	Oranges	100	8,000
Fruits	75	2,000	Ship stores	10	2,000
Grain	75	2,000	Vegetables	100	7,000
Hides	10	1,000	Fish and oysters	200	15,000
Honey, sirup, etc	20	3,000			
Lumber:			Total	2,390	127,000
Rough	300	15,000			
Dressed	200	20,000			

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	75	2,250	75	2,250
Sailing vessels	100	2,000	100	2,000
Yachts	(a)	.....	(a)	.....

a Numerous.

Estimated number of passengers carried by water	300
Estimated total trade of neighborhood carried by water ..... per cent..	90
Probable increase of trade were improvement completed ..... do....	200

The steamer *Mistletoe* was put in commission and makes triweekly trips each way between Sarasota and Tampa, Fla.

O 10.

IMPROVEMENT OF MANATEE RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1332 and 1333, Report of Chief of Engineers for 1896.

In order to comply with the provisions of the river and harbor act of June 3, 1896, which appropriated $4,000 for continuing the improvement, "provided that $3,000, or so much thereof as may be necessary, be used in dredging, deepening, and otherwise improving the navigation of the channel known as the Cut-off, extending from said Manatee River, on the north side thereof, and below the town of Palmetto, into Terraceia Bay," to ascertain the character and extent of the improvement required at the Cut-off, and for the purpose of preparing a project therefor, a survey was authorized July 7, 1896. This survey was made in February, 1897, by the party then in the field in that vicinity engaged upon a survey of Tampa Bay. As a result of the survey and the attending investigations it was ascertained that the improvement was eminently worthy of being undertaken, and has long been desired by persons interested in the commerce of Manatee River and Terraceia Bay.

There are two regular lines of steamers engaged in the commerce of Manatee River and Terraceia Bay; one line from Port Tampa and one from Tampa, besides several boats, both steam and sail, that make trips at more or less irregular intervals. The regular steamers make daily trips to points on the Manatee River. By going into Terraceia Bay the distance, under present conditions, is increased 7 miles. This added distance makes it so difficult for the steamers to make the round trip from Tampa and Port Tampa during daylight and to make connections with the trains that, at present, they run into Terraceia Bay only semi-weekly. With the Cut-off improved so as to afford a safe passage for these steamers, Terraceia Bay would have two steamers daily, touching each way, during about eight months of the year, covering the busy season.

During the past few years the value of property and the amount of commerce in this vicinity has greatly increased, owing to the fact that the severe cold of 1895 caused such slight injury to fruits and vegetables as compared with the damage resulting generally elsewhere throughout the State. It is now said to have become the largest shipping point for these products on the west coast of Florida.

The project submitted for this improvement contemplates the formation of a channel 100 feet wide and 6 feet deep at mean low water, connecting the 6-foot contours in Manatee River and Terraceia Bay, at an estimated cost of $20,000. The amount of money at present available for the purpose will be expended in furtherance of this project. The sum of $1,000 will be expended in improving the main channel of the river.

As stated in the last Annual Report, the combined dredge and snag boat *Suwanee* has now become old, and it will soon become necessary to replace it by another. Where only small appropriations are made available for each river, and the localities at which work can be done to advantage are widely separated, it has been proved that more good can be accomplished by such a plant operated by hired labor than by any

1569 [redacted]

other method. The necessity for the construction of a new boat is urgent, and the recommendation that an appropriation of $50,000 be asked for, to be expended in the construction of a new dredge and snag boat for the improvement of the rivers and harbors in Florida, is earnestly renewed.

Manatee River is in the collection district of Tampa. Tampa is the nearest port of entry. Nearest light-house is Egmont Key Light. Nearest fort is Fort Taylor, Fla.

Money statement.

July 1, 1896, balance unexpended	$4,136.31
June 30, 1897, amount expended during fiscal year	303.50
July 1, 1897, balance unexpended	3,832.81
July 1, 1897, outstanding liabilities	389.37
July 1, 1897, balance available	3,443.44
Amount (estimated) required for completion of existing project	29,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	29,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Appropriations for improvement of Manatee River, Florida.

August 5, 1882	$12,000	August 17, 1894	$3,000
August 5, 1886	11,000	June 3, 1896	*4,000
August 11, 1888	5,000		
September 19, 1890	6,000	Total	47,000
July 13, 1892	6,000		

*Including $3,000 for Terraceia Cut-off.

COMMERCIAL STATISTICS.

Commerce of Manatee River, Florida, for year ending December 31, 1896.

[Furnished by the Plant Steamship Line, H. E. Jacobs, auditor.]

Articles.	Gross tonnage.	Estimated value.
Grain	5,000	$125,000
Merchandise	9,700	2,425,000
Oranges	1,005	76,902
Vegetables	3,275	163,542
Hay	2,000	36,000
Total	21,000	2,826,444

Arrival and departure of steamers.

	Number.	Tonnage.
Arrived	600	200,000
Departed	600	200,000

Estimated number of passengers carried by water	40,000
Estimated percentage of total trade of neighborhood carried on by water	100
Probable increase of trade were improvement completed, per cent	50

O 11.

IMPROVEMENT OF WITHLACOOCHEE RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained, attention is invited to pages 1334 and 1335, Report of the Chief of Engineers for 1896, and to House Ex. Doc. No. 158, Fifty-third Congress, third session, this latter being a report upon a preliminary examination authorized by Congress in the river and harbor act of August 17, 1894.

With an allotment from the appropriation for examinations and surveys in river and harbor act of June 3, 1896, a survey of the river was made during the months of March, April, and May, 1897, from the head of navigation to the mouth. The maps of this survey are now in course of preparation. Aside from this there were no operations during the past fiscal year.

The recommendation made in last Annual Report for the construction of a new combined dredge and snag boat to replace the *Suwanee* for use on this and other rivers and harbors in Florida is again renewed. (See report on Manatee River.)

Withlacoochee River is in the collection district of St. Marks. Cedar Keys is the nearest port of entry. Nearest light-house is Cedar Keys Light. Nearest fort is Fort Marion, Fla.

Money statement.

July 1, 1896, balance unexpended	$785.12
July 1, 1897, balance unexpended	785.12

Appropriations for the improvement of Withlacoochee River, Florida.

March 3, 1881	$7,500	September 19, 1890	$5,400
July 5, 1884	3,000	August 17, 1894	800
August 5, 1886	3,000		
August 31, 1888	5,000	Total	24,700

COMMERCIAL STATISTICS.

No statistics of the commerce of the Withlacoochee River, Florida, for the year ending December 31, 1896, are available.

John L. Inglis, captain of a steamer plying on this river, states that there is no commerce of any importance out of the river at present, on account of the obstruction caused by the bar at its mouth; but that 200,000 tons of phosphate rock, valued at $600,000, are mined along its banks, and the natural outlet is this river.

O 12.

IMPROVEMENT OF SUWANEE RIVER, FLORIDA.

For a description of this locality, the requirements of commerce, the project adopted and its modifications, the methods used, the work accomplished, its cost, and the results obtained attention is invited to pages 1335 and 1336, Report of the Chief of Engineers for 1896.

There were no operations during the fiscal year.

With the appropriation of $3,000 made in the act of June 3, 1896, it

is proposed to continue the work of improving the river in accordance with the approved project, using the U. S. snag boat *Suwanee*, with a hired crew. The boat is now undergoing repairs, and it is expected that it will be available for this work during the course of the next few months. As stated in the report upon the improvement of Manatee River, the *Suwanee* is now old, and having been in almost constant service of a heavy character since its construction in 1889 it must soon be replaced by another. With the small appropriations made for the various improvements at widely separated localities it is impracticable to arrange to have the work done by contract, and a boat of this character is indispensable.

It is estimated that the sum of $15,158, required to complete the work, can be profitably expended in carrying out the project during the fiscal year ending June 30, 1899.

Suwanee River is in the collection district of St. Marks. Cedar Keys is the nearest port of entry. Nearest fort is Fort Marion. Nearest light-house is Cedar Keys Light.

Money statement.

July 1, 1896, balance unexpended	$3,505.77
June 30, 1897, amount expended during fiscal year	8.50
July 1, 1897, balance unexpended	3,497.27
July 1, 1897, outstanding liabilities	276.99
July 1, 1897, balance available	3,220.28
Amount (estimated) required for completion of existing project	15,158.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	15,158.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriations for improvement of Suwanee River, Florida.

June 14, 1880	$5,000	September 19, 1890	$3,000
March 3, 1881	3,000	July 13, 1892	3,000
August 2, 1882	5,000	August 17, 1894	3,000
July 5, 1884	5,000	June 3, 1896	3,000
August 5, 1886	5,000		
August 11, 1888	15,000	Total	50,000

COMMERCIAL STATISTICS.

Commerce of Suwanee River, Florida, for the year ending December 31, 1896.

[Furnished by Horn & Gilbert, Branford, Fla.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Cotton	250	$62,500	Ship stores	12,000	$300,000
Fertilizers	50	1,000	Fish and oysters	10	8,220
Grain	825	15,000	Tobacco	2	1,200
Hides	2	200	Hay	300	5,000
Honey, sirup, etc	25	1,600	Cotton seed	750	6,000
Lumber, rough	11,250	157,500	Empty barrels	260	7,000
Lumber, dressed	250	5,000			
Merchandise	8,500	905,250	Total	34,474	1,470,470

Estimated number of passengers carried by water		3,000
Estimated total trade of neighborhood carried by water	per cent	90
Probable increase of trade were improvement completed	do	80

Three steamers make two round trips a week during the entire year.

O 13.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

WRECKS IN MAN OF WAR HARBOR, KEY WEST, FLA.

Complaint having been made by the Navy Department of the existence of a number of wrecks in Man of War Harbor, Key West, Fla., which were likely, under storm conditions, to be carried into the deeper part of the harbor and endanger the safety of vessels, an examination was made and it was ascertained that nine wrecks were or were likely to become obstructions. They were designated as follows, viz: Bark *Marcelo*, schooner *Adelaide Baker*, bark *Brandon*, schooner *Rosalie*, bark *Anto*, ship *Marie Fredericka*, bark *Almora*, steamer *Cochran*, and the old dry docks. It was estimated that it would cost $27,000 to remove them, which amount was allotted May 14, 1896. Specifications were issued and proposals were invited for the work. Seven bids were received, varying from $11,340 to $56,000, the general average being $25,378. The contract was awarded to Charles W. Johnston, on September 18, 1896, he being the lowest bidder, the contract price being $11,340; but J. Fogarty, owner of the dry docks, protested against the destruction of his property and offered to remove the docks at his own expense. This action received the approval of the Chief of Engineers, provided the docks were removed by the time the contractor had removed the other wrecks. Mr. Fogarty removed the docks, so that the contract price was reduced from $11,340 to $10,240.

Actual work of removal was commenced October 13, 1896, and completed January 23, 1897. During the removal of these wrecks seven others were discovered in the same vicinity that were equally serious obstructions. Under date of February 8, 1897, authority was given to remove these additional wrecks, seven of which, for lack of identification, are designated No. 9, No. 10, No. 11, No. 12, No. 13 (*Florida*), No. 14, and No. 15 (*Cora's* boiler). In addition to these it was also decided to remove the wreck of the steamer *Governor Marvin*, lying nearer the entrance to Key West Harbor. The cost of the removal was to be paid from the allotment of $27,000 made May 14, 1896.

Proposals for the removal of these additional wrecks were opened April 24, 1897. Six bids were received, varying from $6,750 to $15,000. Charles W. Johnston was again the lowest bidder, and the contract was awarded him. The contract was entered into May 11, 1897. Work began June 21, 1897. By the end of June work had been done upon three of the wrecks, viz, *Governor Marvin*, No. 13 (*Florida*), and No. 15 (*Cora's* boiler), but it had not been ascertained whether these wrecks had been completely removed or not.

Chain, anchors, and other ironwork to the amount of 12,900 pounds having been recovered from the wrecks under the first contract, they were disposed of at public auction April 2, 1897. The sum of $15 was the proceeds of this sale, which amount was deposited with the assistant treasurer of the United States at New York, to the credit of the Treasurer of the United States, on account of the fund for removing sunken vessels or craft obstructing or endangering navigation.

WRECKS IN HILLSBORO RIVER AT TAMPA, FLA.

Under date of October 3, 1896, the collector of customs for the port of Tampa, Fla., reported the existence of a wrecked lighter in the channel of Hillsboro River, at Tampa. An examination was made, upon

which a report recommending the removal of the obstruction and estimating the cost at $750 was submitted November 3, 1896. Under date of December 1, 1896, an allotment of funds was made, and steps were at once taken for the removal of the wreck. Notice was given to the owner, and proposals were invited by circular letter, as the work was of limited extent. Eight bids were received, and an agreement was made with Burton E. Coe, the lowest bidder. The work of removal was commenced January 20, 1897, and completed five days later. The total amount expended in the operations, including inspection and contingencies, was $271.92, and the balance of the allotment was canceled.

Abstract of proposals for removal of wrecks from Man-of-War Harbor, Key West, Fla. received and opened August 20, 1896, in response to advertisement dated July 20, 1896.

No.	Name and address of bidder.	Bark Marcelo.	Schooner Adelaide Baker.	Bark Brandon.	Schooner Rosalie.	Bark Anto.	Ship Marie Fredericks.	Bark Almora.	Steamer Cochran.	Dry dock.	Total.
1	P. A. Williams, Key West, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	$29,975
2	Wm. H. Towles, Bartow, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	56,000
3	Somers S. Van Sant, Somers Point, N. J	$1,975	$1,650	$3,875	$750	$2,825	$1,850	$1,190	$1,650	$2,700	18,465
4	Key West Towing and Salvage Association, Key West, Fla	4,000	4,100	5,400	2,200	4,000	5,300	4,200	4,000	3,200	36,400
5	William H. Virden & J. C. Ross, Lewes, Del	3,500	700	4,500	300	1,000	1,100	1,200	1,000	1,500	14,800
6	C. W. Johnston, Boston, Mass.	1,390	550	2,500	250	1,000	700	1,200	2,650	1,100	a 11,340
7	R. G. Ross, Jacksonville, Fla	4,200	4,750	1,250	900	2,800	466	450	1,400	450	16,666

a Accepted.

Abstract of proposals for removal of additional wrecks from Man-of-War Harbor, Key West, Fla., received and opened April 24, 1897, in response to advertisement dated March 24, 1897.

No.	Name and address of bidder.	No. 9.	No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	Governor Marvin.	Total.
1	P. A. Williams, Key West, Fla	$1,600	$800	$600	$350	$250	$300	$275	$3,600	$7,775
2	John L. Mills, Camden, N. J	1,150	950	1,675	750	1,150	950	950	2,172	9,747
3	John W. Chittenden, New York, N. Y	1,607	1,607	1,607	1,607	1,607	1,607	250	1,606	11,500
4	Charles W. Johnston, Philadelphia, Pa	1,000	1,000	1,000	1,000	500	500	250	1,500	a 6,750
5	R. G. Ross, Jacksonville, Fla	.....	.....	.....	.....	.....	.....	.....	.....	15,000
6	L. H. Skinner, Wilmington, N. C	1,400	1,500	1,100	1,500	1,600	1,700	300	1,800	10,900

a Accepted.

Contracts in force during fiscal year for removing wrecks from Man-of-War Harbor, Key West, Fla.

Name of contractor.	Date of approval.	Date of commencement.	Date of expiration.
Charles W. Johnston	Oct. 14, 1896	Oct. 16, 1896	Apr. 16, 1897
Do	May 28, 1897	June 10, 1897	Dec. 10, 1897

O 14.

PRELIMINARY EXAMINATION OF JUPITER INLET, FLORIDA.

[Printed in House Doc. No. 245, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 27, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 19, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of Jupiter Inlet, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

Colonel Benyaurd states that the existing channel at the inlet easily satisfies all the boating interests of the adjacent district, and that Jupiter Inlet is of no particular value from a commercial point of view. It is his opinion, which is concurred in by me, that Jupiter Inlet is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 19, 1897.

GENERAL: I have the honor to submit the following report upon the preliminary examination of Jupiter Inlet, Florida, required by the river and harbor act of June 3, 1896:

Jupiter Inlet is the southern terminus or outlet of the Indian River, which is practically a lagoon 130 miles long extending parallel to the coast from Mosquito Lagoon, on the north, down to the mouth of Jupiter River. It is in latitude 26° 57′ N., longitude 80° 55′ W., and is one of the two natural connections of the Indian River with the Atlantic Ocean. However, though it is one of the natural inlets to the ocean, it has been known to be closed from time to time, and on such occasions, because of the stoppage of free tidal circulation and the accumulation of stagnant water, it has been a source of great annoyance and a menace to the health of the people living in the vicinity. For the past few years it has been practically closed to navigation most of the time, and even when opened it is always a matter of the utmost uncertainty as to how long it will remain so. Any heavy storm may close it, and before the artificial opening was made through Santa Lucia Inlet such a storm, under certain conditions, was liable to open it when closed. Thus, with a heavy rise of water in Jupiter and Indian rivers and with a storm sufficiently severe to cut down the crest of the sand ridge at the inlet, it was possible for the volume of water behind it to work its way through the ridge and thus open up the inlet. However, since the artificial opening referred to has been made, the natural opening of the inlet, due to storms, is much less likely to occur.

By an act approved February 26, 1896, an appropriation of $500 was made to "open Jupiter Inlet, Florida, for the passage of small boats

and vessels," and shortly after a project for the expenditure of this sum was called for. An examination of the inlet was made under my direction on March 15, 1896, by Mr. J. W. Sackett, assistant engineer. It was found to be entirely closed by a ridge of sand running from the bluff line on the north side to the bluff line on the south side directly across it. The width of the ridge varied from 350 feet to 800 feet at mean low water, the elevation of the crest at that stage being from 7 to 9 feet. The result of the examination showed that, to make a cut through the ridge 50 feet wide and 5 feet deep at low water, would require the removal of about 8,000 cubic yards of sand, for which the sum appropriated was inadequate. In August a project for the improvement was approved calling for a cut 40 feet wide on the bottom and 2 feet deep at low water. An agreement to do the work for the amount of money appropriated ($500) was awarded to Mr. F. M. Cabot, who lived in the vicinity of the inlet. He began work on the cut on September 5, 1896, and completed it satisfactorily on September 19. An examination of the cut was made that day, showing it to have a least width of 60 feet and least low-water depth of 2½ feet. Under the natural erosion of the water it was expected that the opening would continue to increase in width and depth for some time, and this has been realized, as, under date of December 26, 1896, Mr. J. W. Cronk, of the United States Weather Bureau, writes me from Jupiter that the cut is now 100 feet wide and 3 feet deep at low water at shoalest places. However, the opening is working southward, which is the natural tendency of such channels along the coast, and it will undoubtedly continue to do so until the channel is finally made so crooked and shallow as to allow of its filling up by some storm. This may not happen for several years, and until then I see no necessity for any attempt being made to maintain an open cut at that point. The existing channel easily satisfies all the boating interests of the adjacent district, and the only other consideration, the health of the community, is well guarded as long as there is any constant flow of water. From a commercial point of view Jupiter Inlet is of no particular value, and I do not consider it worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

O 15.

PRELIMINARY EXAMINATION OF ORANGE RIVER, FLORIDA, TO ITS CONFLUENCE WITH THE CALOOSAHATCHEE RIVER AND THENCE TO THE GULF OF MEXICO.

[Printed in House Doc. No. 248, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 27, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 4, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, concerning a preliminary examination of Orange River, Florida, to its confluence with the Caloosahatchee River and thence to

the Gulf of Mexico, provided for by the terms of the river and harbor act of June 3, 1896.

Colonel Benyaurd states that the Caloosahatchee River has been improved below Myers so as to give a depth of water of about 7 feet at mean low tide, and that this depth would accommodate the commerce from Orange River. He is of opinion, which is concurred in by me, that Orange River is worthy of improvement by the General Government.

It is estimated that a survey for the preparation of plan and estimate of cost of improvement of Orange River would cost $1,200.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 4, 1897.

GENERAL: I have the honor to present the following report on the preliminary examination of Orange River, Florida, in accordance with the provisions of the river and harbor act of June 3, 1896.

The act referred to directed an examination of Orange River to its confluence with the Caloosahatchee River and thence to the Gulf of Mexico.

The Caloosahatchee is now in course of improvement by the General Government under appropriations made from time to time by Congress, with a view of attaining and maintaining a depth of 7 feet at mean low water over a width of 100 feet. The approved project for the improvement contemplated gaining that width and depth from the mouth of the river to Myers. The character of the Caloosahatchee being so well known, the preliminary examination directed in the act was confined to Orange River from Myers to its head, a distance of about 12 miles.

This stream is narrow, with a width of about 150 feet at its mouth, which width gradually decreases to about 75 feet at the head of navigation. The channel depth is from 6 to 21 feet, with the exception of four shoal places, where the depth is reduced to about 18 inches with an average rise of mean tide of 12 to 16 inches. Dredging through these shoal places would constitute the improvement to be undertaken to give a navigable depth for the class of boats plying the river. The aggregate length of the cuts would be about 1,050 feet. In addition, there will be a number of snags to be removed and overhanging trees to be cut down.

Below Myers the Caloosahatchee has been improved so as to give a depth of about 7 feet at mean low tide, which depth would accommodate the commerce coming from Orange River.

The country adjacent to Orange River is well adapted to the culture of the orange, and has been quite rapidly filled up by orange growers since the widespread freeze of several years ago, and there is every evidence of a considerable prospective increase in the number of growers. The only outlet for the products of this region is by water, via Orange River and the Caloosahatchee, as there are no railroads and the wagon roads are very poor. Considering the facts of the case, I concur with

Lieutenant Meyler that Orange River is worthy of improvement by the General Government.

The estimated cost of the survey for the purpose of making a plan for the improvement of this stream, etc., is estimated by Lieutenant Meyler at $1,200.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. JAMES J. MEYLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., December 21, 1896.

COLONEL: I have the honor to report that, in accordance with instructions received from you, I proceeded to Myers on December 15, 1896, for the purpose of making a preliminary examination of Orange River or Creek, Florida, to its confluence with the Caloosahatchee River and thence to the Gulf of Mexico.

Orange River is a small stream, navigable for about 6 miles above its mouth, which lies on the left bank of the Caloosahatchee about 6 miles above Myers. It was formerly called Twelve Mile Creek, because of the fact that its head waters are about 12 miles above Myers, but of late years it has been generally called Orange River because of the large amount of citrous fruit, especially oranges, raised in the groves along its banks. The stream is narrow, being not more than 150 feet wide at its mouth and 75 feet wide at the head of navigation, but, with the exception of four shoals, the channel depths of from 6 to 21 feet are sufficient for all present and immediately prospective traffic.

Captain Menje, of Myers, who has been running a couple of small steamers between that town and the head of Orange River, gave me most valuable data concerning the obstructions along the route. From soundings which he had taken and measurements made he informed me that at mean low water the depth on the shoals was not more than 18 inches, the average mean tide being 12 to 16 inches. The length of cut necessary across the four shoals would be about as follows: 300 feet, 250 feet, 200 feet, and 300 feet, or an aggregate of about 1,050 feet, and a width of cut of about 50 feet, and depth of 4 feet at mean low water would answer all purposes. The materials to be found in the shoals are mud and sand, and it is quite certain that no rock is to be found, unless at considerable depths. Besides the shoals, the river is further obstructed by snags and by overhanging trees along the banks. Any improvement of the stream would therefore include the cuts across the shoals, the removal of snags and sunken logs, and the cutting down and trimming of overhanging timber, most of which is live oak. From the mouth of the river to Myers the only obstructed channel is found at the end of the jetty just below Beautiful Island. With the funds that had been appropriated prior to 1894 for the improvement of the Caloosahatchee River, the shoal at Beautiful Island was dredged to 4 feet at mean low water and a training wall provided to concentrate the water through the dredged cut. However, since the construction of the jetty some shoaling has begun just below it, and on several occasions passing boats have been detained there at low stages of tide. It is probable that a small amount of annual dredging will maintain the 4 feet of depth through these shoals. Below Myers the Caloosahatchee River has been improved to a depth of 7 feet at mean low water, which is more than sufficient to satisfy the demands of all commerce coming out of Orange River.

I am indebted to Captain Menje for the commercial statistics of Orange River for the present year:

	Value.	Freight.
Oranges, 15,000 boxes, at $2.50	$37,500	$1,500
Grape fruit, 1,000 boxes, at $10	10,000	100
Vegetables, 15,000 crates, at $1	15,000	1,500
Total value	62,000	3,100

The number of fruit-bearing trees is increasing in great proportion from year to year, and new trees are being continually put in. Water transportation is absolutely necessary for all of this produce, as there are no railroads and the wagon roads in that section are very poor.

I am of the opinion that the commercial interests involved are such as to justify the General Government in improving Orange River. I estimate that a survey of the stream from its mouth to the head of navigation will cost about $1,200.

Very respectfully, your obedient servant,

JAMES J. MEYLER,
First Lieut., Corps of Engineers.

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

O 16.

PRELIMINARY EXAMINATION OF INSIDE PASSAGE FROM PUNTA RASA TO CHARLOTTE HARBOR, FLORIDA.

[Printed in House Doc. No. 246, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 27, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 4, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of the inside passage from Punta Rasa to Charlotte Harbor, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

It is the opinion of Colonel Benyaurd, concurred in by me, that this inside passage is worthy of improvement by the General Government.

It is estimated that a survey for the purpose of preparing plan and estimate of cost of improvement would cost $1,500.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 4, 1897.

GENERAL: I have the honor to present the following report of the preliminary examination of the inside passage from Punta Rasa to Charlotte Harbor, made in accordance with the river and harbor act of June 3 last. The examination was made by Lieut. James J. Meyler, Corps of Engineers, whose report is appended.

This inside passage is known as Pine Island Harbor, and is part of the direct water route from the Caloosahatchee River to Charlotte Harbor, or by way of Boca Grande Pass to more northern Gulf points.

With the improvement of a few shoal places by dredging, ample depth of water would be afforded for the class of steamers and other vessels that navigate this inner passage. There is quite a considerable amount of products already carried over this route, which will be greatly increased in the future, as this section of the State is constantly

increasing in population. Considering, therefore, the present and prospective amount of commerce, and the comparatively small expense of improving certain shoal places, I deem the inside passage worthy of improvement by the General Government.

The estimated cost of the survey is $1,500.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. JAMES J. MEYLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., December 21, 1896.

COLONEL: I have the honor to report that, in accordance with instructions received from you, I proceeded to Punta Gorda, and, on December 15, made a preliminary examination of the inside passage from Punta Rasa to Charlotte Harbor, Florida. Punta Rasa lies at the mouth of the Caloosahatchee River, and the inside passage referred to is that between Pine Island on the east side and Lacosta, Sanibel, and a number of small islands on the Gulf side. It is part of the direct water route from the Caloosahatchee River to Charlotte Harbor, or, by way of Boca Grande Pass, to more northerly points on the Gulf. At present the principal traffic through it is that carried by the Plant Steamship Company's steamers, the *Saint Lucie* and the *Lawrence*, plying between Punta Gorda, lying at the mouth of Pease River, in the northern side of Charlotte Harbor, and Myers, lying on the left bank of the Caloosahatchee and about 20 miles above its mouth. The distance between the two points is about 75 miles. The population of Punta Gorda is between 1,200 and 1,500, and that of Myers is about the same. The steamers on the "down trip" carry grain, general merchandise, and crate material, the most of which goes to Myers, while returning from that point the freight for Punta Gorda consists almost entirely of oranges, grape fruit, and early vegetables. It would seem that the people of both towns would be benefited by any improvements of their waterway, but I found but little interest in the matter among the Myers people and none at all among those at Punta Gorda. Even individuals at the latter place, who had been named to me as men very much interested in the matter, declared that they knew and cared nothing about it.

I was therefore compelled to depend entirely upon Captain White, of the *Saint Lucie*, for all of the information which I could gather concerning the inside passage. He pointed out to me the few points at which improvements in the channel are desirable or necessary, and also assisted me in taking soundings at such places. In the inside passage there are points near the north end of Pine Island and near the south end of the island where the channel is not only extremely narrow, but the depths are such as to make the passage of a heavily-loaded boat, when a strong northwester is blowing, both uncertain and hazardous. In fact, on several occasions the steamers have been upon the shoals at both places, and have taken from one to three hours to get off into the channel again. The least depth at mean low water at each place is about 5 feet, and the dredging necessary to accommodate the present traffic, as well as that of the near future, would be about the same in each case. The upper point is on the shoal called the "horseshoe," lying between Patricio Island and the northern point of Pine Island, and the other point is near the southern end of Pine Island, directly opposite Blind Pass. The length of cut necessary in each case is about 500 feet, and if dredged to a depth of 7 feet at mean low water, the width of cut being abont 100 feet, the improvement would be amply sufficient to satisfy the demands of all present and immediately prospective commerce.

The shipment from Myers to Punta Gorda for the present year is about as follows:

	Value.	Freight.
25,000 boxes oranges	$62,500	$2,500
75,000 crates vegetables	75,000	7,500
1,700 boxes grape fruit	17,000	170
Total	154,500	10,170

I was informed that the value of general merchandise, grain, and crate material shipped to Myers during the year was about $150,000. Myers is the center of a very rich and fertile country, and its commercial importance must increase rapidly for the next few years. I was informed by interested parties at Myers that they have calculated an increase of about 100 per cent in the fruit crop alone for next year.

The dredging asked for can probably be done at slight cost, and in view of the importance and value of the commercial traffic through the passage, I deem it worthy of improvement by the General Government. I estimate that a survey of the upper and lower parts of the inside passage would cost about $1,500.

Very respectfully, your obedient servant,

JAMES J. MRYLER,
First Lieut., Corps of Engineers.

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

O 17.

PRELIMINARY EXAMINATION OF HILLSBORO BAY, FLORIDA, FROM ITS CONFLUENCE WITH TAMPA BAY THROUGH HILLSBORO BAY AND RIVER TO THE CITY OF TAMPA.

[Printed in House Doc. No. 229, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 26, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 19, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of Hillsboro Bay, Florida, from its confluence with Tampa Bay through Hillsboro Bay and River to the city of Tampa, made to comply with provisions of the river and harbor act of June 3, 1896.

It is the opinion of Colonel Benyaurd, concurred in by me, that Hillsboro Bay, from its confluence with Tampa Bay through Hillsboro Bay and River to the city of Tampa, is worthy of improvement by the General Government.

No survey is necessary for the preparation of plan and estimate of cost of the improvement.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 19, 1897.

GENERAL: I have the honor to present the following report upon the preliminary examination of Hillsboro Bay from its confluence with Tampa Bay through Hillsboro River to the city of Tampa.

The examination was made under my direction by Mr. J. W. Sackett, assistant engineer, whose report is appended.

An examination for the improvement of the channel in this bay leading to the wharves at Tampa was made in 1879. The narrow and

crooked channel then existing was found to have a depth of 5.5 feet at mean low water. Two projects were considered, one to improve the old channel by dredging to a depth of 9 feet for a width of 200 feet in the river and 150 feet in the bay; the other to provide for a new channel extending from a point near the mouth of the river along a straight line on the shortest line to deep water in Hillsboro Bay with the same dimensions as proposed in the other project. While the straight channel was 1,500 yards shorter than the old channel, the latter was adopted for the reason that it was considered the most convenient to improve, and the only one that could be reasonably expected to be permanent.

From reports of Mr. Sackett it would appear that experience in this district during recent years indicates that a straight channel formed by dredging, with the dredged material, or a portion of it, deposited along the sides of the channel in such a manner as to form a shoal which will act as a training wall and where the current does not attain a velocity in excess of 3 feet per second, can be maintained at a comparatively little expense. On the other hand, a channel such as the present channel at Tampa, consisting of continuous curves, has proven to be very difficult to maintain, a large portion of each succeeding appropriation being expended in removing material deposited in the previous cuts made during the cessation of work. Furthermore, to enable vessels to follow the channel, numerous channel marks are required.

Current observations made in 1887 by Mr. Sackett from a point about one-half mile below Spanish Town Point, and about one-third mile above the outer end of channel, showed that the current for no appreciable length of time flowed along the length of the channel at that place.

Considering all the conditions, if it be deemed desirable to undertake further work of improvement a straight channel is decidedly to be preferred. With this view and assuming that a depth of 12 feet would answer the demands of commerce, Mr. Sackett made an investigation as to the character of the material that would be encountered on a line most favorable for the location of a straight channel from the mouth of Hillsboro River to a depth of 12 feet in Hillsboro Bay, and found that beyond the mouth of the river no rock would be encountered above that depth at mean low water.

Tampa has grown from a small village to a city of considerable commercial importance. The letter from the secretary of the Tampa Board of Trade shows the growth of the place from the inception of the work of improvement. Port Tampa, distant 9 miles, is the terminal point on the bay of the Plant system, having accommodation for vessels of 20 feet draft, with a prospective increase to 24 feet at mean low water. Tampa is growing rapidly, and a channel that will accommodate the lighter draft ships is desired in the interests of her trade with outside points independent of the conditions that control at Port Tampa.

A number of surveys have been made by the Coast and Geodetic Survey and by the Engineer Department, and sufficient information is at hand to enable an estimate to be made as will preclude the necessity of making additional surveys. Tracings from the original charts of the Coast Survey show that a channel with an available depth of 12½ feet extends from Tampa Bay through Hillsboro Bay to within 14,500 feet of the mouth of Hillsboro River, measured on a straight line. By the present channel the distance from the mouth of the river to the 12-foot contour in the bay is 28,500 feet.

* * * * * * *

In my opinion Hillsboro Bay, from its confluence with Tampa Bay through Hillsboro Bay and River to the city of Tampa, is worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF MR. J. W. SACKETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 4, 1897.

COLONEL: In accordance with your instructions, I have the honor to report that I proceeded to Tampa, Fla., on November 15, 1896, for the purpose of making a preliminary examination of Hillsboro Bay from its confluence with Tampa Bay through Hillsboro Bay and River to the city of Tampa.

Tampa Bay, 25 miles from the entrance, is divided into two arms. The easterly arm is known as Hillsboro Bay. This bay is about 10 miles long, north and south, and has an average width of 4½ miles. An available channel depth exists through Tampa Bay of 20 feet. At the confluence of Hillsboro Bay with Tampa Bay, and thence for a distance of 3 miles up Hillsboro Bay, the channel is obstructed by shoals having from 10 to 11 feet over them. A practicable channel way exists through these shoals, having a least depth of 12½ feet at mean low water.

The 12-foot contour approaches the mouth of the Hillsboro River at the city of Tampa to within a distance of 14,500 feet, measured on a straight line. By the line of the present channel the distance is 28,500 feet. The available depth by the present channel into Tampa is 7 feet at mean low water. This channel is narrow and tortuous and can only be navigated by even very light-draft craft with the aid of numerous channel marks which are difficult to maintain. Several examinations and surveys have been made with a view of improving this channel. The earliest undertaken by the Engineer Department, as far as our records show, was made in 1871. One, in more detail, was made in 1879, the report of which is contained in the Annual Report of the Chief of Engineers, 1879, pages 870 to 873. The available channel depth was then found to be 5½ feet at mean low water. A ledge of rock extending across the channel in the mouth of the river had only 7 feet of water over it.

An appropriation of $10,000 was made in the act of June 14, 1880. From motives of economy and the desire for early results, combined with what, at that time, was thought to be the best solution of the problem from an engineering standpoint, the money was expended in deepening the present channel. A straight channel from a point near the mouth of the river along the shortest distance to deep water was considered, but at that time it was thought that such a channel would be difficult to maintain. Experience since then, however, shows that straight channels through similar material and under like conditions, with the dredged material judiciously deposited along the sides, can be maintained at very little additional expense, while on the other hand, with small appropriations and without the aid of training walls and deflecting dikes, a continuously curved channel, such as the one under discussion, where a depth throughout of 9 feet was desired, can not be secured, much less maintained. Current observations taken by myself at this place in 1887 show that throughout portions of the channel, at least, the current at no time flows in the direction of the channel either on the ebb or on the flood; neither does it continue in one direction throughout the duration of either tide. An aggregate of $80,000 has been expended upon this channel. A depth of 9 feet over a width of 200 feet has been secured in the river, where mostly rock excavation was required, but in the channel below there are places where it is less than 80 feet in width and the available depth is only 7 feet.

With the extension of the South Florida Railway across the peninsula separating Hillsboro Bay from Old Tampa Bay, in 1888, the necessity for continuing the improvement in Hillsboro Bay began to be less apparent. The channel leading into Old Tampa Bay was improved so that vessels drawing 20 feet could come to the wharf at Port Tampa, the terminus of the railroad. It was then thought that this would satisfy the demands of commerce. The fact remains, however, that the terminus is in the hands of one railway corporation with no competition, and the additional transfer entailed of merchandise received at Tampa is an item of considerable expense.

During the last fifteen years Tampa has grown from a mere village to a city of a

population of 25,000. Most of this growth has been during the last two years. The accompanying letter from the secretary of the Board of Trade of Tampa shows in detail the growth of the business of the city. I am informed that, in addition to what is there shown, the city does a considerable wholesale business throughout the southern portion of the State.

There is one regular line of schooners plying between Tampa and New York. These vessels find it necessary to lighter part of their cargoes to enable them to reach the wharves at Tampa. There is an average range of tide at Tampa of 2.2 feet.

The numerous surveys made by the Engineer Department are in sufficient detail to enable an estimate of the cost of a channel that would answer the demands of commerce to be prepared, with the possible exception of the amount of rock that would require removal from that portion of the river above the mouth and above where work has heretofore been necessary in the execution of previous projects. Sufficient soundings to rock have been taken to make a fair approximation of the amount that would require removal. If greater accuracy is required an additional survey would be necessary. It is estimated that such a survey would cost $1,500.

On December 14, 1896, I made additional investigations as to whether rock would be encountered along the line of a straight channel direct from the mouth of the river to deep water in Hillsboro Bay. Twenty-five soundings approximately equidistant were taken with an iron rod. I was enabled to reach depths varying from 12 to 20 feet, depending upon the character of the material. In none of these soundings was rock encountered. The material was found to be mostly a mixture of sand and mud. In a few instances hard sand was found, and at one sounding taken at a point 300 feet south of the east point of Depot Key, in a depth of one-half foot of water, what appeared to be a stiff clay was found at a depth of 9 feet, and we were unable to penetrate with the rod to a greater depth than 12 feet. With this exception depths varying from 13 to 20 feet were reached.

It is believed that a permanent, deeper, and wider channel can be secured at this place with no greater expenditure than is commensurate with the interests involved.

Very respectfully, your obedient servant,

J. W. SACKETT, *Assistant Engineer.*

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

LETTER OF THE TAMPA BOARD OF TRADE.

TAMPA BOARD OF TRADE,
Tampa, Fla., November 24, 1896.

SIR: Referring to your recent visit to Tampa for investigation and information on which to base a report for the improvement of Tampa and Hillsboro bays, and your request for statistics of the city's business, by direction of the Tampa Board of Trade the following is respectfully submitted for your information:

Population:	
1884	1,200
1896	25,000
Custom-house receipts:	
1880	$181.49
1895	686,327.07
First six months of 1896	367,066.00
Total amount internal revenue collected first six months of 1896	155,343.98
Receipts of post-office for fiscal year ending June 30, 1896	21,000.00

Shipping statistics, first ten months of 1896.

	Coastwise.		Foreign.	
	Vessels.	Tons.	Vessels.	Tons.
Entered	184	153,197	66	47,623
Cleared	143	109,645	52	41,669

Freight (by railroads).

First six months, 1896:	
Total tons of freight received	52,000
Total tons of freight forwarded	20,000

Assessed value of property for purposes of taxation.

1890	$609,523.00
1896	5,336,195.65
Total amount invested in buildings in Tampa during the year 1895	1,156,729.00

In the matter of the number of coastwise vessels having entered and cleared, the foregoing statement simply covers the record of the custom-house and does not include a large number of small vessels engaged in local trade with tributary points on the bay and coast, of which it is impossible to get an accurate record and data.

It does not seem possible for us to make an intelligent approximate estimate of the probable increase in the shipping business should the proposed improvement of our harbor be made. That it would be very large can not be questioned. Neither can it be doubted that our shipping and general business interests have been very seriously damaged in the past by the lack of reasonable obtainable water, and it can not be expected to increase until relief is given us by the desired improvement.

Considering the large and increasing amount of money that is being annually paid to the Government from customs and internal revenues (exceeding $1,000,000), Tampa feels that she is entitled to a reasonable expenditure in the improvement of her harbor.

Trusting that the foregoing statistics cover the information desired, we beg to remain,

Yours, very respectfully,

THE TAMPA BOARD OF TRADE,
By H. J. COOPER, *Secretary.*

J. W. SACKETT, *Assistant Engineer.*

O 18.

PRELIMINARY EXAMINATION OF CLEARWATER HARBOR, FLORIDA.

[Printed in House Doc. No. 249, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 27, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 19, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of Clearwater Harbor, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

For the reasons presented, Colonel Benyaurd is of the opinion, which is concurred in by me, that Clearwater Harbor is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 19, 1897.

GENERAL: I have the honor to present the following report upon the preliminary examination of Clearwater Harbor, Florida, as provided for in the river and harbor act of June 3, 1896.

The examination was made by Mr. J. W. Sackett, assistant engineer, whose report is appended.

This is the third examination that has been made of this locality. The first was made in 1884, followed by a survey, and an estimate was presented for improvement. Congress, however, made no appropriation therefor. Another examination was made in 1887 in connection with Anclote and St. Joseph bays, but the localities were not deemed worthy of improvement.

There appears to be no commerce that would be benefited by an improvement of this harbor. It is now only as a pleasure and health resort that the bays and adjacent waters derive some degree of importance, and any improvement undertaken would be of benefit to pleasuse craft rather than for any commercial considerations. Under the circumstances I do not consider Clearwater Harbor as worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF MR. J. W. SACKETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 2, 1897.

COLONEL: I have the honor to submit the following report of a preliminary examination of Clearwater Harbor, Florida, made on November 17, 1896, in accordance with your instructions.

Clearwater Harbor is a shallow sound on the west coast of Florida, about 20 miles north of the entrance to Tampa Bay.

This body of water lies between the mainland and two low-lying islands called Clearwater Key and Sand Key.

The harbor has an average width of 1¼ miles and a length of about 10 miles. It connects with the Gulf of Mexico through St. Josephs Bay adjoining it on the north, through Big Pass between Hog Island and Clearwater Key, and through Little Pass between Clearwater Key and Sand Key.

At the extreme southern end the harbor connects with Boca Ceiga Bay through a narrow, tortuous, and shallow channel called "The Narrows." In the vicinity of Big Pass, and from there to the vicinity of Little Pass, the harbor is much obstructed by small islands and mud and sand shoals, through and among which two or more well defined but disconnected channels pass. The main channel leading from Big Pass has depths varying from 6 to 21 feet. From the vicinity of Little Pass toward the south the harbor has an average depth in the middle of about 6 feet, gradually shoaling toward either shore and the southern extremity.

This harbor was made the subject of a preliminary examination in October, 1884, followed by a survey made in December of the same year, reports of both of which are to be found in Report of Chief of Engineers, 1885, pages 1323 to 1329.

The means of communication had with commercial centers at that time were by steam and sailing vessels running to Cedar Keys and by overland route to Tampa. It was deemed worthy of improvement and so reported. Congress, however, failed to appropriate any money for the improvement. A subsequent preliminary examination of this harbor made in 1887, in connection with Anclote and St. Josephs bays and the narrows into Boca Ceiga Bay, seemed to develop the fact that at that time improvement of the places mentioned was not worthy of being undertaken. Since then the construction of a railroad along this section of the west coast of Florida having its southern terminus at St. Petersburg, on Tampa Bay, and connecting with the principal railway systems of the State in its northerly course, has caused a material decrease in the amount of commerce carried on by water.

One small schooner drawing 6 feet of water trades regularly between Mobile, points in Clearwater Harbor, and the Manatee River.

Mr. H. B. Plant, president of the Plant system of railways, has undertaken very extensive improvements at Belleair, a new town and pleasure resort on Clearwater Harbor, about 1 mile south of the town of Clearwater. It is now as a pleasure and health resort that Clearwater Harbor and the bays and sounds along that portion of

the coast have come to be considered rather than in a commercial light. With this in view, the improvement of the various channels seems to be desired, in order to better accommodate pleasure craft. For this purpose the project recommended in the report of the Chief of Engineers for 1885, before referred to, would fulfill all reasonable requirements, and it would seem that a further survey would be unnecessary. If it be considered that further improvement would be desirable, the deepening of one of the channels leading into the harbor from the Gulf of Mexico necessarily claims attention. Of these channels there are two—one through Big Pass and the other through Little Pass. The available depth on the bar at Big Pass is 6 feet at mean low water. There is a trifle more at Little Pass, but the channel just inside the pass is so obstructed by shoals that there is considerably less water there than at Big Pass.

Up to about eight years ago the channel at Little Pass was better than at Big Pass. A heavy storm at that time caused the former to widen, and shoals formed in the channel and the harbor inside. It is doubtful that the channel through either pass could be permanently deepened without a system of jetty construction. * * *

The accompanying commercial statistics,* furnished by the local agent of the railway and Mr. H. W. Bachman, a merchant, can be considered as fairly approximate.

Very respectfully, your obedient servant,

J. W. SACKETT, *Assistant Engineer.*

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers.

O 19.

PRELIMINARY EXAMINATION OF CRYSTAL RIVER, FLORIDA.

[Printed in House Doc. No. 221, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 26, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated the 4th instant, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of Crystal River, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

It is the opinion of Colonel Benyaurd that Crystal River is worthy of improvement by the General Government, provided that the channel to be improved is found not to contain rock. He therefore recommends that a survey, estimated to cost $1,800, be made of the river with a view to ascertaining with certainty the character of the river bottom and preparing estimate of cost of the improvement required. I concur in his views and recommendations.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 4, 1897.

GENERAL: I have the honor to present the following report on a preliminary examination of Crystal River, Florida, made under my directions by Lieut. James J. Meyler, Corps of Engineers, in accordance with the provisions of the river and harbor act of June 3, 1896:

This is the fourth examination that has been made of this stream with

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* Not received.

a view to the improvement of the bar and entrance. The previous examinations were made under the direction of Major (now Lieutenant-Colonel) Damrell in 1881, Captain Black in 1889, and Major Handbury in 1894, and the reports thereon will be found in those of the Chief of Engineers, United States Army, for 1882, 1889, and 1895, respectively.

The reports of the officers above referred to, while adverse to the improvement, qualified their recommendation by expressing their opinion that the river was not worthy of improvement at that time, implying thereby that at some future period the improvement might be considered necessary.

The obstructions to the navigation of the entrance previously found were a rocky ridge, some 1,500 feet across, and shell and sand bars, through which the channel had to be cut. The expenses attending the execution of this work were deemed incommensurate with the benefits that would result to commerce. The same obstructions were found during the present examination, but a channel was found by Lieutenant Meyler leading to the inner waters of the river whereby the excavation through the rocky reef could be avoided, and with a comparatively little expense a channel giving a depth of 6 feet could be obtained, which would be all that is needed for the present commercial necessities of Crystal River. Once inside the mouth of the river, there is a beautiful stretch of water covering 1,500 feet in width, with a depth of 16 feet, to the town of Crystal River, at the head of navigation, some 8 miles above.

The extent of country tributary to Crystal River is about 400 square miles. There is now a fair amount of commerce on the river, and this would undoubtedly be increased were the channel through the bar at the entrance improved. Considering all these circumstances, I deem that Crystal River is worthy of improvement by the General Government, providing, of course, that the channel described by Lieutenant Meyler is found to be as reported, without any rock, which, if found, would greatly increase the cost of improvement. I therefore recommend a survey of the river and entrance, without actually committing the Government to the improvement. The estimated cost of such survey is $1,800.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. JAMES J. MEYLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., December 19, 1896.

COLONEL: I have the honor to submit the following report of a preliminary examination of Crystal River made by me. In pursuance of instructions received from you, I proceeded to the town of Crystal River, situated at the head of the stream of that name, on December 10, 1896, and made the required examination of the stream and its mouth in the Gulf on the following day. The river and the shoals at its mouth have been the subject of three previous examinations, as follows: That of Mr. P. Robinson, assistant engineer, in 1881; that of Lieut. (now Capt.) D. D. Gaillard, Corps of Engineers, in 1889; and that of Mr. J. W. Sackett, assistant engineer, in 1894; and I respectfully invite attention to their reports thereon, published in Chief of Engineers' Reports for 1882, 1889, and 1895, respectively.

Crystal River, which lies about 25 miles southeast of Cedar Keys, is a fine stream,

averaging about 1,500 feet in width and 16 feet in depth throughout its length. It is tidal from its mouth to its source, a distance of about 8 miles, and runs in a generally westward direction. From the mouth, where it is divided into two passes, the south and the main channel, to the open Gulf, a distance of about 3¼ miles, the channel is narrow and tortuous, winding among numerous sand and shell bars and oyster beds.

In making the examination of this channel, I was very fortunate in having for pilot a Captain Paul, who undoubtedly knows those waters better than any other man. He found no difficulty in taking me over the deepest water of the natural channel, and I took soundings 30 feet apart along its axis throughout the 3¼ miles. These soundings showed the existence of very much the same state of affairs as was found by my predecessors in their examinations.

The stretch of the river just above the mouth if produced would follow a course about west by south, but the channel from the mouth runs in a generally northwesterly direction for about 2,500 feet and then in a generally southwesterly direction for about 4,500 feet. These two courses may be considered the two sides of a triangle, of which the base would lie on the west by south course, the prolongation of the lower stretch of the river. The channel then follows this base line produced for about 5,500 feet to the gap at the entrance to Bull Slough. Across Bull Slough, which is about a mile wide, the course to the deepest water across the bar at the Gulf entrance is about west by north. As shown by accompanying sketch * (A) this gives four general courses from Shell Island, which divides the mouth of the stream into two passes to the outer bar. Taking these courses in their consecutive order I found the following results:

Along the first course a ridge of limestone about 1,500 feet wide and with a least mean low-water depth of about 3½ feet. The rest of this course gave a least mean low-water depth of 5 feet at a few points, the average being between 6 and 7 feet.

The second course showed about 2,500 feet of mud, sand, and shell bars, with a least mean low-water depth of about 3½ feet. The rest of the course gave 6 to 11 feet of water.

The third course showed sand and shell bars and occasional lumps, aggregating in all about 1,000 feet in width and with a least depth of 4 to 4½ feet at mean low water. The rest of the course gave depths from 6 to 7 feet.

At the gap at the entrance to Bull Slough the channel is very narrow and deep and the current swift. Across the slough the depth of water varies from 6 feet to 15 feet, the average being 8 or 9 feet.

On returning from the outer bar, Captain Paul informed me of the existence of deep water on either side of an oyster bar, through which a channel might be cut and the limestone ridge in the first course avoided. After careful investigation and taking numerous soundings this water was found as stated by him. I then ran over it, leaving the second course at the inner side of its bar and running right up to the oyster bar. I began sounding in 8 feet of water (the tide being then about mean low water) and held a depth of 6 feet or more until within 550 feet of the center of the bar, which lies above low water, and is about 300 feet across between 4-foot contours. I then skirted the end of the bar and resumed sounding on the other side of it in 4 feet of water.

From here to Shell Island but one small shoal of sand and mud was found, with a least depth of 4 feet and width of about 150 feet. I went over this ground again very carefully, and am satisfied that the blasting out of a cut across the limestone ridge in the first course may be avoided by a comparatively small amount of dredging across the oyster bar. The pilot and the other interested parties of Crystal River, who assisted me in every way possible, state that this passage has never been pointed out before when examinations were being made. In fact, Captain Paul is the only man in that locality who is thoroughly acquainted with the waters at the entrance, and he has unfortunately always been away at the time of previous examinations. The people of Crystal River are united in asking for a channel 6 feet deep and 60 feet wide from Shell Island to the Gulf. Assuming that no rock will be found underlying the bars within this 6-foot limit, such a channel can be opened up by dredging, and at a comparatively small cost.

I estimate that a survey of the river and its mouth would cost about $1,800.

The extent of country tributary to Crystal River is about 400 square miles and the estimated population is about 2,500. The total business of the town is estimated at $145,000. This includes an output of 6,500 boxes of cedar slats for pencils by the Dixon Crucible Company. The entire commerce of the place is now carried on by railroad, and the freight rates are so high as to be actually prohibitory in many cases.

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*Not printed.

I am indebted to the principal business men of the town for the following commercial statistics for the year 1896:

Articles.	Value.	Freight.
EXPORTS.		
6,500 cases cedar slats, at $11	$71,500	$6,500
10,000 crates early vegetables, at $1	10,000	5,000
7,000 barrels fish, at $4	28,000	10,500
6,000 barrels oysters, at $1.25	7,500	900
6,000 gallons oysters, at 80 cents	4,800	600
2,000 barrels turpentine, at $12.50	25,000	2,100
8,000 barrels resin, at $5	40,000	6,800
Total	146,800	32,400
IMPORTS.		
300,000 feet pine lumber, at $10 per M	3,000	600
312 cars of cedar logs	60,000	10,920
General merchandise, grain, provisions, etc	100,000	12,500
Total	163,000	24,020

Many articles which could be produced in great abundance are not shipped or handled at all, because the freight rates on the railroad eat up all the profits. The people there claim that water transportation would mean a saving to them of 33⅓ per cent on freight at the very lowest calculation, and assuming that but one-half of the freight would be carried by water in case they had a 6-foot channel at mean low water, it is evident that the saving would even then be more than commensurate with the cost of the improvement. For this reason I recommend the mouth of the river as worthy of improvement by the General Government.

Very respectfully, your obedient servant,

JAMES J. MEYLER,
First Lieut., Corps of Engineers.

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers.

O 20.

PRELIMINARY EXAMINATION OF HARBOR AT CEDAR KEYS, FLORIDA.

[Printed in House Doc. No. 247, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 27, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 4, 1897, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a preliminary examination of harbor at Cedar Keys, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

For the reasons given Colonel Benyaurd is of the opinion, which is concurred in by me, that the harbor at Cedar Keys is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 4, 1897.

GENERAL: I have the honor to present the following report on the preliminary examination of the harbor of Cedar Keys, Fla., in compliance with the provisions of the river and harbor act of June 3 last. The examination was made under my direction by Lieut. James J. Meyler, Corps of Engineers, whose report is appended.

Between the years 1872 and 1890 appropriations aggregating $104,500 were made by Congress for the improvement of this harbor by dredging the channel. In 1892 the officer in charge of this district recommended that the improvement of Cedar Keys be discontinued until an increased commerce, actual or fairly prospective, would make further improvement necessary.

Lieutenant Meyler's report gives in detail the present state of the channels, which, under ordinary conditions, appears to be all that is necessary for the present commercial demands of Cedar Keys. There has been no increase in the commerce of this place for a number of years, and there appears to be nothing that would warrant any prospective increase sufficient to demand that the improvement be again taken up. Under these views, I am compelled to report that the harbor of Cedar Keys is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF FIRST LIEUT. JAMES J. MEYLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., December 18, 1896.

COLONEL: I have the honor to report that, in compliance with instructions received from you, I proceeded to Cedar Keys, and on December 8 and 9 made a preliminary examination of the harbor of that place.

I found that much uncertainty existed in the minds of those interested in the improvement at this locality as to the extent and direction in which it was most needed. Some contended that further deepening of the cuts and channels in the harbor was desired, while others stated that the resolution was intended to cover an examination of the waters in the inside passage, between Cedar Keys Harbor and the mouth of the Suwanee River. In this latter case the necessary improvements would be confined principally to the shoals at Derrick Island Gap, about 7 miles from Cedar Keys and about halfway between the town and the mouth of the river.

I accordingly made examination of both waterways. I had an excellent man to act as pilot for me, a Captain Wilson, who probably is better acquainted with the channels in that vicinity than any other person. He found no difficulty in taking me over the best water in the natural channels and in the cuts made by the Government across the Middle Ground Shoal, the shoal near Buoy No. 12, and that across the bar at the entrance from the Gulf. Numerous soundings taken along the axis of the channel showed that very little, if any, deterioration had taken place in the cuts made some years ago. In fact, no doubt exists as to the continual deepening of the cut across the outer bar. Both Captain Wilson and Captain Crevasse, of the *Suwanee Belle*, which plies the Suwanee River, told me of boats they had piloted across the bar in late years at comparatively low tide drawing as much as 13½ feet of water. The cut across it was made several years ago and 12 feet was the depth obtained. A depth of 9½ to 10 feet was obtained in the cuts across the Middle Ground and the shoals lying between the Middle Ground and the southern point of Sea Horse Key, and the soundings taken showed that such depth yet existed, even after several years of practical disuse of the channel.

The soundings taken at Derrick Island Gap showed a similar state of affairs. In the act approved September 19, 1890, an appropriation of $2,500 was made for Cedar

Keys Harbor, with the provision that a portion could be expended at Derrick Island Gap, on the inside passage to the Suwanee Basin. Under the approved project, which was to obtain a 5-foot channel at mean low water from Cedar Keys to the mouth of the Suwanee, a channel was dredged at Derrick Island Gap 1,196 feet long, 37½ feet wide, and 6 feet deep. Soundings along the axis of the cut showed a least depth at present of 5½ feet at mean low water throughout the cut. The only trouble found with this cut was its narrowness, which, with the fact that the stakes which marked out the cut were nearly all blown down in the great storm of September 29 last, made it extremely difficult to pick out the channel on either side of the gap.

The same may be said of the cut across the Middle Ground and the shoals beyond it. It is quite possible that that storm, which flooded the town of Cedar Keys to a depth of 3 to 4 feet and destroyed portions of the railroad track and bed for a distance of 6 miles from town, may, by backing up such an enormous body of water, have caused the slight decrease in depth found in the different cuts.

The commerce carried on in Cedar Keys Harbor has been very slight for several years. Since 1888 it has shown no sign whatever of increase. However, it is contended by some of those interested that if the Government were to improve the channels from the town to the outer bar to a depth of 13 or 14 feet, so as to admit of the entrance of vessels of greater draft, the town would soon resume its old-time importance of the period when it was the most southern railroad terminus on the west coast of Florida. The same parties admit that they can not hold out the inducement of present commercial needs to warrant the Government in taking up further improvements of the harbor proper. Those who advocate further improvements of the inside passage to the Suwanee River are much more reasonable in their demands. An increase in width of cut at Derrick Island Gap would be desirable, though not at all necessary for the present water traffic through it, which is carried on in light-draft vessels, for which the existing channels afford ample facilities. It is claimed that increased depths would facilitate the shipment of larger amounts of phosphate from the lower Suwanee section, as well as a very much larger shipment of cedar and pine lumber and timber. In all cases those who claim that they are entitled to further harbor improvements by the General Government base their claims on the prospective, not the present, demands of commerce, but in my opinion these demands are entirely too uncertain and of too distant a future to warrant the Government in making further improvements.

Very respectfully, your obedient servant,

JAMES J. MEYLER,
First Lieut., Corps of Engineers.

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

O 21.

SURVEY AT PALMBEACH, FLORIDA.

[Printed in House Doc. No. 292, Fifty-Fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 11, 1897.

SIR: I have the honor to submit the accompanying copy of report of January 23, 1897, with map, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a survey at Palmbeach, Fla., provided for by the river and harbor act of June 3, 1896.

The plan presented contemplates the construction of a breakwater on the reef (the only location practicable within limits of cost) extending some 200 or 300 feet northward of the ocean pier and southward some 1,000 to 1,500 feet, a cut through the reef near and beyond the southerly end of the breakwater, and the dredging of a basin inside. The total estimated cost of this work as given by Colonel Benyaurd is $600,000.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 23, 1897.

GENERAL: I have the honor to present the following report on the survey of Palmbeach, Fla., in compliance with the provisions of the river and harbor act of June 3, 1896:

Under date of May 1, 1896, a report was rendered by me upon a survey of the locality now under consideration, and a project was submitted for a breakwater along the line of the reef and outside, which, with a dredged interior basin, would, it was thought, meet the requirements of the commerce that was claimed would seek an inlet and outlet at Palmbeach. The cost of the improvement recommended was so great, however, that it was considered inadvisable to present the project for the consideration of Congress.

The present survey had for its object a reconsideration of the matter for the purpose of presenting a plan for the construction of a breakwater and an interior dredged basin, which, it was thought by the projectors of the enterprise, would, at less cost than the plan formerly presented, subserve all needful purposes of the commerce of Palmbeach.

The survey formerly made covered an area of about 3½ miles long, extending from the ocean pier northward 8,300 feet, southward, 11,500 feet, and extending seaward about three-fourths of a mile. The information derived from that survey was so complete that it was not deemed necessary to undertake additional fieldwork, but only to carry to completion the field notes and charts of the former survey.

An inspection of the chart formerly presented shows the existence of a rocky reef extending up and down the coast (at the particular location in question), the crest of which lies about 1,000 feet beyond the low-water line on shore in the vicinity of the pier. The width of the reef appears to be from 200 to 300 feet. From the pier northward this reef approaches the shore line, into which it merges in an irregular manner, at a distance of about 7,000 feet. Southward from the pier the shore line approaches the reef, so that at a point 2,200 feet distant the low-water line is 900 feet from the crest of the reef, and at a point 2,800 feet farther southward it is 750 feet. From the last point the reef and the shore line are approximately parallel for a distance of about 2,000 feet, when the reef begins to approach the shore.

To the northward of the pier the area included within the 12-foot contour is about 7½ acres. This area is triangular in shape, with a base along the line of the pier of about 500 feet and an extension northward of about 1,200 feet. The greatest depth in this area is 14½ feet, except immediately adjacent to the outer angle, where a depth of 15½ feet is found.

The area south of the pier between the reef and the shore line, in excess of 12 feet in depth, is continuous for a distance of 8,800 feet and contains about 60 acres. At the site of the pier this area is 500 feet wide, but proceeding southward it decreases in width so that at a point distant about 3,000 feet it is only about 200 feet wide. Continuing southward it maintains a width varying from 200 to 300 feet for a distance of 2,500 feet before it narrows to 150 feet.

The depth of water along the line of the reef is comparatively uniform; throughout the greater portion of its length it does not vary a foot more nor a foot less than 7½ feet.

The pier is about 1,500 feet long, so that it extends beyond the crest of the reef some 500 feet.

The construction of a breakwater so as to afford a harbor outside of the reef and thereby give protection to the pier or wharf must, by reason of great depths, be considered impracticable on account of the great expense attending such a construction, and not worthy of consideration when the commercial interests involved are taken into account.

The question of improvement and construction is then for a structure along the line of the reef.

In a letter* to the Secretary of War, under date of August 18, last, Mr. H. M. Flagler, president of the Florida East Coast Railway Company, outlined a plan of improvement which he considered would accommodate the present shipping, and offer a roadstead in stormy weather. The suggestion was to build a breakwater on the reef, extending some 200 or 300 feet northward of the ocean pier, and southward some 1,000 to 1,500 feet; to make a cut through the reef near and beyond the southerly end of the breakwater, and to dredge a basin inside. Assuming the cross section of the breakwater first designed for this locality, viz, height 10 feet above mean low water with a thickness on top of 20 feet, and with slopes seaward and shoreward of one and a half on one and one on one, respectively, there would be required about 75,000 tons of large rock for the indicated length. That amount with the dredging, it is estimated, would cost approximately as follows:

75,000 tons large rock	$375,000
50,000 cubic yards rock blasted and dredged	150,000
60,900 cubic yards inside dredging, at 25 cents	15,000
Contingencies 15 per cent	60,000
Total	600,000

The dredging is for the purpose of giving a depth of 15 feet at mean low water in the basin south of the pier, and the proposed cut through the reef is taken at the same depth.

While this construction would in a measure serve the purpose of partially protecting that portion of the pier inside the reef and offer partial shelter to light-draft vessels, it would not subserve the purposes of a large foreign trade, such as was considered would make an entry at Palmbeach. It would only be a question of a short time when the utility of the small harbor offered by the above construction would be destroyed by the accumulation of sand brought into it by the well-known action of the waves from both the north and the south.

From a study of the charts of the survey it is evident that the only location for a breakwater is along the line of the reef; that is, within practicable limits of expense. The limited distance of the reef from the shore and the depths would give a very contracted anchorage and a limited wharf extension. Of course, to provide a greater area the breakwater could be extended northward and southward, and one can judge of the cost of the extension and of the necessary dredging by reference to the estimates above presented. To simply extend the breakwater along the reef would not alter the other conditions as regards the danger of silting up the interior basin. A long, narrow shelter would in this manner be constructed, but it must be considered that the proximity of the reef to the shore would render it dangerous for a vessel to attempt to make the anchorage in a storm.

If the breakwater be extended along the reef beyond the limits

* Printed in House Doc. No. 295, Fifty-fourth Congress, second session.

above mentioned, each 100 feet would cost approximately $24,000, and for a like length of dredged area inside the approximate estimate would be $3,600. The additional cost of reaching the shore and making a basin that would be protected against the movement of sand would depend upon the locality selected for this extension shoreward; and the construction being in much deeper water than that on the line of the reef, would necessarily be much more expensive.

* * * An inquiry of the deputy collector of customs as to the commerce of Palmbeach develops the following trade between the date of the establishment of the port in January, 1896, to the 30th of November:

British steamer *Northumberland*, net tonnage 519 tons, entered and cleared twenty-six times; engaged mainly in transporting tourists to and from Nassau.

American schooner *Drummond*, net tonnage 15 tons, entered and cleared once.

American schooner *Manatee*, net tonnage 29 tons, entered and cleared once.

The following, which did not have to enter or clear at the custom-house, also arrived and departed: U. S. S. *Raleigh*, tug *Martha Helen*, tug *Three Friends*, and several yachts, of which no record had to be kept.

There is transmitted, herewith, a chart of the survey of Palmbeach.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

O 22.

SURVEY OF BISCAYNE BAY, FLORIDA.

[Printed in House Doc. No. 295, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 11, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 31, 1897, with two maps,* by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, of the results of a survey of Biscayne Bay, Florida, made to comply with the provisions of the river and harbor act of June 3, 1896.

The plan of improvement presented provides for a channel along the line of the present buoyed channel at Cape Florida entrance 12 feet deep into the anchorage ground inside the shoals and 10 feet deep thence to Miami, with widths of 500 feet on the outer shoal, 300 feet along the inside portion of the outer shoal and through the inner shoal to the anchorage, and 150 feet thence to Miami. The cost is estimated at $239,000. A channel of similar widths and a depth of 12 feet throughout would cost $845,000.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

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* Not reprinted. Printed in House Doc. No. 295, Fifty-fourth Congress, second session.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 31, 1897.

GENERAL: I have the honor to present the following report on a survey of Biscayne Bay, Florida, made in compliance with the river and harbor act of June 3, 1896:

The preliminary examination of the bay was made by Maj. Thomas H. Handbury, Corps of Engineers, and the report thereon will be found in the Report of the Chief of Engineers, United States Army, for 1895, page 1567 et seq. From this report it appears that Biscayne Bay is some 36 miles in length, with an average width of 6 miles, and has an approximate area of 216 square miles. Over fully one-half of this area there is a low-water depth of 6 feet and less; over the remaining half the average is not above 10 feet. Several small streams that take their rise in the Everglades to the westward empty into the bay. The most considerable of these is the Miami River, at the mouth of which is the site of old Fort Dallas.

The Florida East Coast Railway Company has, to some extent, improved the channel depth and width of this little stream and carried the improvement into the bay for a distance of some 2 miles. This improvement will be referred to hereafter. The east side of the bay is limited throughout its entire length by coral reefs that have risen from the ocean bed. Through this line of reefs or keys there are several openings, by means of which communication is had between the bay and the ocean. Outside and beyond the line of keys, at a distance of about 3 miles, and running nearly parallel thereto, there is a second line of detached coral rocks that are just awash at high water. The water between these two lines is known as Hawk Channel, and is used as a passageway for steamers from Miami to Key West by way of the Cape Florida Entrance.

The entrance to Biscayne Bay from this inner passage or from the ocean may be made through three "cuts" by light-draft vessels, though the most southern passage affords the best water. Starting from the northward, these three entrances are Norris Cut, Bear Cut, and Cape Florida Entrance. They are described by Major Handbury as follows:

Norris Cut is the most northerly of these entrances, and is the first to separate the keys from the mainland. It is about one-quarter of a mile in width, and has upon its bar at low water about 4 feet. I was told, by reliable persons well acquainted with these waters, that there is a reef under this bar with about 2 feet of sand upon it. This would make 6 feet the maximum depth that could be obtained without recourse to blasting. I had no means of ascertaining how wide this reef is. Within the cut, and in the shoal inside, there is a narrow channel about a mile in length, having a depth from 6 to 8 feet. The water then shoals up, and for the next 2 miles, going toward the interior of the bay, there is an average depth of about 3 feet. The mouth of the Miami River is directly opposite this cut. Near it there is a narrow channel in the bay having a depth of 7 feet. The best water to be found within the bay and a range of 3 miles from the mouth of the cut does not exceed 8 feet.

Bear Cut is 1½ miles to the southward of Norris Cut and separated from it by a low island, called Virginia Key. It is about one-half a mile in width and has upon its bar a low-water depth of 4 feet. I was told that there is a rock reef 8 feet below the low water on this bar, covered with about 4 feet of sand. Eight feet, then, is the limit of the depth that can be expected over this bar, without recourse to blasting. The width of the reef was not ascertained.

From the bar there is a narrow channel about 3 miles in length leading into the bay. Through this 10 feet could be carried, with very little improvement of its present condition, into the bay, where the same depth is found. If the difficulty at the bar were removed this would be a very accessible and desirable route for vessels passing between the bay and Hawk Channel.

About 4 miles to the southward of Bear Cut and at the lower end of Key Biscayne we find Cape Florida. Immediately below this point there are three narrow channels

making in across the low sand flats that here cover the coral reef. Through these, depths of 10 and 12 feet can be carried into the bay to where there is the same depth, but in order to get into either one from the Hawk Channel a tortuous course over a shoal flat, having about 8 feet limit upon it, must be gone over. By this course the distance is about 9 miles. The most direct course would be about 4 miles, but over this there is a less depth of water. A small amount of dredging might give 11 feet over this course, but owing to the exposed location of the shoal and the attendant circumstances of light sands and prevailing storms it could not be expected that the dredged cut would maintain itself. Permanent works, such as training dikes or jetties, would be impracticable, as their cost would be out of proportion to the benefits to be derived from them.

My observation and study of the country bordering Biscayne Bay lead me to suppose that the bottom of the bay throughout its whole extent is a coral-rock formation, similar to that between its western shore and the Everglades, not always level, but containing depressions which are filled with sand. This being the case, the prospects for improving much beyond their present depths any portion of the bay or either of the cuts leading into it are not very encouraging. A series of borings will be necessary to ascertain at what depth rock is to be found.

* * * * * * *

Under the provisions of the act of June 3 an allotment of $2,500 was made for this survey. The general operations were under the direction of Mr. J. W. Sackett, whose report is appended. The direct field work, borings, etc., were conducted by Otto Bie, with the aid of the force attached to the U. S. S. *Suwanee*.

* * * The main entrance of the bay, the one buoyed and marked for vessels by the Light-House Establishment, is at Cape Florida, and has, with a few exceptions, a depth of from 10 to 12 feet throughout. The excepted portions are in a basin lying inside the outer reef. This basin is protected by outlying shoals, and appeared much more susceptible to improvement than the entrance at Bear Cut or Norris Cut. * * * Upon due consideration, that channel through the Cape Florida Entrance appeared to be the one most desirable to have improved in the interests of the commerce and shipping that sought an entrance and exit from Biscayne Bay.

This selection seemed to be in the line of the wishes of the interests involved, as indicated in a letter of H. M. Flagler to the Secretary of War, which is appended. This letter relates to contemplated improvements at Palmbeach and at Biscayne Bay, and appears to indicate that the improvement undertaken by the Florida East Coast Railway Company was for the improvement of the channel from Miami (the terminus of the railroad) to the entrance at Cape Florida, the desire being to obtain a channel from 12 to 15 feet between those two points.

* * * * * * *

The preliminary survey made in April, 1896, developed the fact that it was impracticable to improve the channel leading into and through Biscayne Bay to a depth in excess of 12 feet within any ordinary limits of expense, and considering the amount of commerce involved this depth was deemed sufficient. This view might be further supplemented by the fact that the improvements undertaken by the railway company in the channel leading to Miami River and in the river itself, for the accommodation of its trade, did not even come up to this requirement of depth. These facts were borne in mind in making the recent survey. * * * With a depth not to exceed 12 feet it is believed the Cape Florida is the better route. * * * Should the interests of commerce ever demand channels of 15 or even 18 feet leading into the mouth of Miami River, the most favorable location, as stated, would possibly be through Norris Cut.

* * * * * * *

The survey made covered an area of about 21 square miles in the vicinity of Cape Florida in addition to the ground covered by the sur-

veys in the vicinity of Miami River. Charts of both of these surveys are submitted herewith. That of Cape Florida is on a scale of 1:10000, that of Miami River, 1:5000.

In considering the question of the channel from Cape Florida to Miami River the survey showed no changes from the charts of the Coast Survey, excepting the channel in the Miami River and to the southward, dredged by the railway company. The dredged channel was carried from the 9-foot contour, at the upper end of the bay, into the river, and some shoals in the river were removed so that a depth of 11 feet was afforded at a number of places. This dredged depth is understood not to have been fully maintained, as shoaling of the channel has been reported at several points in the river and in the bay.

A study of the maps of the surveys seems to indicate the most feasible project to be the formation of a channel of 12 feet depth and of ample width from the deep water east of Cape Florida into Biscayne Bay through the present channel to an anchorage ground inside, in which there is an area 7,000 feet long and averaging 1,700 feet wide, having a depth in excess of 15 feet. The present available depth throughout the basin of Biscayne Bay is 10 feet, though there are large areas where 11 to 12 feet are found. The present channel dredged in the Miami River and in the immediate channel outside may be considered as giving a width of 60 feet and a depth of 9 feet.

The following estimate is presented for a channel along the line of the present buoyed channel at Cape Florida Entrance 12 feet deep into the anchorage ground inside the shoals and 10 feet deep thence to Miami; 500 feet wide on the outer shoal, 300 feet along the inside portion of the outer shoal, 300 feet wide through the inner shoal to the anchorage, and 150 feet thence to Miami:

315,000 cubic yards of sand, at 30 cents	$94,500
240,000 cubic yards of sand, at 20 cents	48,000
26,000 cubic yards of rock, at $2.50	65,000
Engineering and contingencies, about 15 per cent	31,500
Total	239,000

To make the channel 12 feet deep throughout, otherwise of same dimensions, the cost would be increased to $845,000.

As before stated, it was not known until after the survey was completed that it was desired that estimates should be presented for channel depths of 15 and 18 feet over a width of 150 feet. It may be incidentally mentioned that such a width is considered too small for the depths mentioned.

From the information at hand approximate estimates for the amount of material to be removed for the desired channel through Norris Cut can be presented, though there may be some question as to the amount of rock included. Considering that the rock is at an average depth of 12 feet below mean low water, the estimated cost of the proposed channel is:

15-foot channel, 150 feet wide:	
935,000 cubic yards sand, at 20 cents	$187,000
450,000 cubic yards rock, at $3	1,350,000
Engineering and contingencies, about 10 per cent	153,000
Total	1,690,000
18-foot channel, 150 feet wide:	
1,049,000 cubic yards sand, at 20 cents	209,800
840,000 cubic yards rock, at $3	2,520,000
Engineering and contingencies, about 10 per cent	270,200
Total	3,000,000

To protect the entrance, jetties will be required, and in the above estimates the cost of the rock excavation is included in placing the material on the line of the jetties. In the 15-foot channel the north jetty will be 2,400 feet long and the south jetty some 2,000 feet long. In the 18-foot channel the north jetty will be 3,000 feet long and the south jetty 2,400 feet long. The commercial statistics of Biscayne Bay are not sufficiently definite as to cause me to express an opinion as to the benefit that would be derived by the Government by the expenditure of the large sums required for the improvements for which estimates are presented. It may be possible that the future demands of commerce may make this bay a most desirable place to improve with the expenditure of these sums. At the present time a side-wheel river and bay steamer makes semiweekly trips between Miami and Key West, and various small vessels and yachts enter the bay. The products that reach Miami by water and are then shipped by rail appear to come from the chain of keys that stretch southward from the Cape Florida Entrance.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF MR. J. W. SACKETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., January 7, 1897.

COLONEL: I have the honor to submit the following report of the survey of Biscayne Bay, Florida, made in October and November, 1896:

Previous investigation made it apparent that an improvement of Biscayne Bay would need, first, the improvement of one of the three entrances. The main entrance, at Cape Florida, presenting most favorable conditions for improvement within reasonable limits, a detailed survey at this place was essential. Of the interior of the bay, only such additional information was required as would show whether any change had taken place since the surveys of the United States Coast and Geodetic Survey had been made.

In this respect no changes of importance were disclosed excepting the channel leading into the Miami River. The Florida East Coast Railway Company has dredged a channel into the river from the 9-foot contour in the bay and has removed some shoals in the river itself. The survey necessarily included this channel. Having fixed upon the location of the survey, and the general methods to be employed, the work was left in charge of Mr. O. N. Bie, to whose report attention is respectfully invited for information as to the manner in which the survey was conducted.

The progress of the survey was very much interfered with by almost continuously bad weather. Mr. Bie's report contains the following statement: "Of the twenty-eight working days consumed since the soundings began, only three were sufficiently fair to enable us to sound on the outer shoal." The survey in the vicinity of Cape Florida covered an area of 21 square miles. In making this survey about 16,900 soundings were taken and 27 miles of shore line, including the edge of banks bare at mean low water, were located.

This survey has been plotted on a scale of 1:10,000. The survey of the mouth of the Miami River, and the dredged channel leading into it from the deeper portion of the bay, has been plotted on a scale of 1:5,000. The survey made in April, 1896, developed the fact that it was impracticable to improve the channel leading into and through Biscayne Bay to a depth in excess of 12 feet. This was borne in mind in making the recent survey.

It was not known until the survey was completed that estimates were desired for greater depths. In any event the funds available for making the survey were insufficient to develop with any degree of accuracy projects having in view the improvement of the channels to a greater depth than 12 feet. In the first place, it is out of the question to consider the improvement of a channel through Cape Florida entrance and up to the mouth of the Miami River to depths of 15 feet and 18 feet on account of the great distance over which dredging would be required. If the inter-

ests of commerce should ever demand channels of 15 feet or even 18 feet in depth leading into the mouth of the Miami River the most favorable location would be through Norris Cut.

Having been directed to prepare estimates for such channels 150 feet in width, I beg to state that the data at hand are sufficient to make a close approximation of the total amount of material which would require removal, but information regarding the relative amount of rock included is sadly lacking. From the best information available rock is believed to exist along the line selected at an average depth of 12 feet below mean low water. Assuming such to be the case, the following estimate for channels through Norris Cut has been prepared:

15-foot channel, 150 feet wide:	
935,000 cubic yards of sand, at 20 cents	$287,000
450,000 cubic yards of rock, at $3	1,350,000
Engineering and contingencies, about 10 per cent	153,000
Total	1,690,000
18-foot channel, 150 feet wide:	
1,049,000 cubic yards of sand, at 20 cents	209,800
840,000 cubic yards of rock, at $3	2,520,000
Engineering and contingencies, about 10 per cent	270,200
Total	3,000,000

In computing the amount of excavation required 1 extra foot in depth and side slopes of 1 on 3 have been allowed.

To protect the entrance, jetties will be required as follows: For the 15-foot channel the north jetty will need to be 2,400 feet long, and the south jetty 2,000 feet long. For the 18-foot channel the north jetty will need to be 3,000 feet long, and the south jetty 2,400 feet long. In preparing the above estimate the price for rock excavation is intended to include the cost of placing the excavated rock in the jetties. Adopting a cross section for the north jetty, having the top at a reference of 5 feet above mean low water with a width of 20 feet, and the side slopes of the jetty 1 on 1½, and the same cross section for the south jetty, except that the crest width would be only 10 feet, the jetties for the 15-foot channel would require not more than 110,000 cubic yards of rock, and for the 18-foot channel not more than 150,000 cubic yards, so that if the amount of rock excavation will be as great as has been assumed, there will be sufficient to increase the volume of the jetties to four times as much as the above cross sections would give for the 15-foot channel and nearly six times as much as they would give for the 18-foot channel.

A channel 150 feet wide throughout its length is manifestly too narrow to accommodate vessels of from 15 to 18 feet draft, especially at the entrance and where the wharves may be situated.

As before stated, when the recent survey was undertaken it was with a view of obtaining information as to the best location for a channel which would afford a depth of 12 feet into Biscayne Bay, and to consider such further improvement in the bay itself as the additional investigation might indicate to be practicable.

A study of the resulting maps seems to indicate the most feasible project to be the formation of a channel 12 feet in depth, and of ample width, from the deep water east of Cape Florida into Biscayne Bay through the present channel to an anchorage ground in which there is an area 7,000 feet long and averaging 1,700 feet wide, having a depth in excess of 15 feet. The present available depth throughout the basin of Biscayne Bay is 10 feet, although there are large areas where 11 and even 12 feet is found. The Florida East Coast Railway Company has dredged a channel from the upper portion of the basin before mentioned to the mouth of the Miami River 9 feet deep and 60 feet wide, and has widened the natural channel in the river to as much as 200 feet in front of the railway wharf at Miami. This dredged channel in many places is as much as 11 feet deep. This channel could be enlarged to a width of 150 feet and a depth of 10 feet, and the total expenditure involved would be within a reasonable amount, as shown by the following estimate:

Estimate for a channel along the line of the present buoyed channel at Cape Florida entrance 12 feet deep into the anchorage ground inside the shoals, and 10 feet deep from there to Miami, 500 feet wide on the outer shoal, 300 feet along the inner portion of the outer shoal, 200 feet wide through the inner shoal to the anchorage, and 150 feet wide from there to Miami.

315,000 cubic yards of sand, at 30 cents	$94,500
240,000 cubic yards of sand, at 20 cents	48,000
26,000 cubic yards of rock, at $2.50	65,000
Engineering and contingencies, about 15 per cent	31,500
Total	239,000

To make the channel 12 feet deep throughout, otherwise of the same dimensions, the cost would be increased to $845,000.

It has been suggested that instead of dredging a channel into the mouth of the Miami River from Norris Cut, a basin be excavated immediately inside the entrance at Norris Cut. The amounts of the estimates for the 15-foot and 18-foot channels—$1,690,000 and $3,000,000, respectively—would be sufficient to provide a basin about 1,700 feet square of the respective depths. This, of course, depends upon the amount of rock excavation required, in regard to which definite information is lacking. As before stated, it is believed that the average depth to rock is 12 feet, but in selecting a site for a basin a depression in the rock surface might be found that would materially lessen the cost.

The currents in Biscayne Bay rarely attain a velocity of a mile an hour excepting at the entrance. The maximum velocity observed during the current observations at Cape Florida was 1.4 miles per hour. The mean range of tide at Cape Florida is 1.51 feet, and at Miami it is 0.70 foot. The present available depth at mean low water on the outer shoal at Cape Florida entrance is 9½ feet, and at the inner edge of the shoal it is 7½ feet. The latter shoal could be removed to a depth of 10 feet at a cost of $5,000, provided a dredge was available for the work.

Very respectfully, your obedient servant,

J. W. SACKETT, *Assistant Engineer.*

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers.

REPORT OF MR. O. N. BIE.

UNITED STATES DREDGE SUWANEE,
Miami, Fla., November 28, 1896.

COLONEL: I have the honor to submit the following report on the survey of Biscayne Bay, Florida, in the vicinity of Cape Florida and the mouth of the Miami River.

The U. S. snag boat *Suwanee* was used as quarters for the surveying party, consisting of myself, Messrs. E. B. Thompson, J. L. Parr, and J. M. Braxton, transit men; George E. Brown, recorder, and the snag-boat crew.

SURVEY OF CAPE FLORIDA.

Actual field work began on October 20. Three transit stations were erected in proper relative positions on the banks between the cape and Soldier Key. These stations were made of three 6 by 6 inch scantlings, sunk to an average depth of 8 feet in the sand, and securely braced. A triangular platform, supported on 4 by 4 inch scantlings, sunk into the sand and braced, was placed around the station and about 8 inches from it. This enabled the transit man to move freely without risk of shaking his transit. A tripod of 4 by 4 inch by 32-foot scantlings, with a whitewashed target and surmounted by a flagstaff with flag, was placed over the station. Similar stations have been built on previous surveys by Mr. J. W. Sackett, assistant engineer.

Base line and triangulation.—The base line, Cape Florida Light-house to Fowey Rocks Light-house, obtained from the United States Coast and Geodetic Survey records, was used for triangulation. Every station in the triangulation system was occupied, and transit angles carefully taken and repeated.

Bench marks.—Levels were run and checked from the United States Coast and Geodetic Survey bench mark on the sill of door of Old Tower to the wharf at Jones's house, and tide gauge established with zero mean low water. A gauge was also established at station "Snapper" and checked by simultaneous readings on both gauges. The lowest reading observed during the survey was 0.9 foot, which was probably due to continuous fresh easterly winds. Of the twenty-eight working days consumed since the soundings began, only three (November 10, 11, and 13) were sufficiently fair to enable us to sound on the outer shoal.

Soundings.—Soundings were taken from a naphtha launch, running at an average speed of 4½ miles per hour. The lead line used was checked every evening. Soundings were located every minute by two transits. About 16,900 soundings were taken and 27 miles of shore line (including edge of banks) were located.

Borings.—Twenty borings were taken on the bars of north and south channel, on the shoal extending southeastward from the cape, and along the general line of the main channel. Rock was found on the shoal at depths ranging from 10.8 to 14.6 feet, and along the channel from 12 to 19.5 feet.

Current observations.—Current observations were taken during four consecutive tides near the point of intersection of axes of main and north channel.

A pole float submerged 16 feet, attached to a very light fishing line 135 feet long, thoroughly waxed, was used, and the velocities and directions of ebb and flood obtained every half hour. Three surface floats were sent out on the flood from the current station, and from two points 100 feet and 200 feet south, respectively. They drifted into the north channel, and were then carried by the waves and strong northeast wind up on the bank on the south side of the channel. An attempt was made November 28 to take current observations near Buoy No. 2, and also additional borings, but the shaft of the naphtha engine broke, and the weather was too stormy to attempt the work from a rowboat. The maximum current velocities observed were 1.96 feet per second on the ebb and 2.04 feet per second on the flood. This survey was completed November 28.

SURVEY OF MOUTH OF MIAMI RIVER.

On October 29, the weather being too stormy for our work at Cape Florida, and the naphtha engine in bad order, we proceeded to Miami River and began survey at its mouth. A base line 2,586.2 feet was measured and checked along the west side of the canal bank and the system of triangulation developed, extending from the mouth of the canal to the first bend above the bridge which is being constructed across the river. About 1,800 soundings were taken from the railroad wharf to the south end of the canal, shore lines located, and 11 borings taken along the canal. Soft lime rock was found at depths ranging from 9.1 feet to 19 feet; several borings were taken to 20 feet and no rock found. The survey was completed November 5, and the survey at Cape Florida resumed the same day. Maps of the Cape Florida and Miami River sections of the Biscayne Bay survey to the scale of 1:10000 and 1:5000, respectively, were partially completed and forwarded to your office on the 26th instant.

Very respectfully, your obedient servant,

O. N. Bie.

Lieut. Col. W. H. H. Benyaurd,
Corps of Engineers, U. S. A.

LETTER OF PRESIDENT OF FLORIDA EAST COAST RAILWAY.

Florida East Coast Railway,
New York, August 18, 1896.

Dear Sir: Sometime last year in pursuance of an act of Congress, a survey was made for harbor improvement at Palmbeach. The examination and report was made by Colonel Benyaurd, of the Engineering Corps, stationed at St. Augustine, Fla.

The amount called for by this report was larger than General Craighill deemed could be expended, and a further act of Congress, at the same session, we understand, authorized you, in your discretion, to have further survey and report made, looking to a smaller outlay, which would give protection to shipping and the improvements already made.

The report of Colonel Benyaurd shows that there is a reef about 1,200 feet from the shore, which runs north and south nearly parallel with the shore for more than 2 miles, running close to the shore at either end, with approximately 9 feet of water on the reef. Inside there is from 9 to 15 feet of water, with sand bottom capable of being dredged to 25 feet in depth. Within 200 feet on the outside of the reef the water is 22 feet in depth and goes into deeper water very quickly.

The Florida East Coast Railway has built a pier about 1,500 feet in length from the land and across the reef about one-half mile from the north end of the reef at a very great cost, at which vessels may land in good weather.

Without going into the details of the needs, we believe that 200 or 300 feet of breakwater on the north side of the pier, with 1,000 or 1,500 feet on the south side built on the reef, with an opening blasted in the reef on the south side near the end of the proposed south breakwater, and a limited amount of dredging on the inside, then such work as would protect that already done would accommodate for the present the shipping and afford a roadstead in stormy weather (as vessels can land at the pier in ordinary weather), accomplish all that the present needs demand and afford protection to the large outlay already made.

The same act permits survey at Biscayne Bay, and I would respectfully ask that this, too, receive attention. The amount appropriated for this survey was insufficient, and consequently little has been done. The Florida East Coast Railway Company, however, has spent since February, of this year, over $20,000, and is still spending further sums in improvements in the bay. This work has been confined to making deeper channels in the bay between Cape Florida and the railroad wharf, which wharf is in the Miami River, about half a mile from the bay.

The total length of the channel dredged is 8,500 feet (1¼ miles) with a medium depth of 9 feet at low water, with a width between banks of 90 feet. The banks of deposit are submerged, except near the mouth of the river where the material is being taken away in lighters.

The dredge at present is excavating rock inside the river to straighten the channel and enable large boats to turn around opposite the railroad wharf.

The total amount of excavation in the channel outside the river amounts to 115,750 cubic yards of soft material and 750 cubic yards of rock. The excavation inside the river will amount to nearly 20,000 cubic yards of rock and 5,000 cubic yards of soft material. The bay has little or no rock.

The south end of the canal or channel is 6¼ miles from Cape Florida, and at low tide (tide rises fully 18 inches to 2 feet) a vessel drawing 9 feet can come to the railway wharf in the Miami River and turn around in the basin now being excavated. Prior to the cutting of this canal a vessel drawing 5 feet could come up to the entrance of the Miami River, but there was barely 3 feet over the shoal at the mouth. The channel inside the Miami River was too crooked for navigation by boats of large size, and the channel was not wide enough to turn around in.

In two weeks we can bring the *City of Richmond*, a steamer 233 feet in length and 50 feet beam, drawing 7½ feet of water, to the railway dock in the Miami River. She is now running between Miami and Key West. We would like more water at this point, and believe that from 12 to 15 feet can be obtained at moderate cost, and that the work already done can be much improved and protected.

The report of Colonel Benyaurd on Palmbeach is in the office of General Craighill, and for a more full setting forth of the reasons of this improvement I attach copy of letter* written by Vice-President Parrott last winter to Hon. W. B. Hooker, chairman of the River and Harbor Committee. I also attach a blue print* showing the situation at Palmbeach. Your kind consideration of this matter and early action will be appreciated by—

Yours, very truly,

H. M. FLAGLER,
President.

The Honorable SECRETARY OF WAR.

O 23.

SURVEY OF TAMPA BAY, FLORIDA, FROM PORT TAMPA TO THE MOUTH OF THE BAY.

[Printed in House Doc. No. 88, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., July 16, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated June 30, 1897, with map,† by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, upon the results of a survey of Tampa Bay Florida, from Port Tampa to the mouth of the bay, made to comply with the provisions of the river and harbor act of June 3, 1896.

The project submitted provides for obtaining a channel, by means of dredging, 24 feet deep at mean low water, 500 feet wide on the bar at the entrance to Tampa Bay, and 300 feet wide in the bay itself. The proposed work will, it is estimated, cost $336,000. Colonel Benyaurd states that this estimate of cost is based upon the assumption that a contract will be authorized for the completion of the work under the continuous-contract system.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. R. A. ALGER,
Secretary of War.

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*Not printed.

†Not reprinted. Printed in House Doc. No. 88, Fifty-fifth Congress, first session.

REPORT OF LIEUT. COL. W. H. H. BENYAURD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., June 30, 1897.

GENERAL: I have the honor to submit the following report on a survey of Tampa Bay, Florida, made in compliance with the river and harbor act of June 3, 1896:

The preliminary examination of the bay was made in October, 1894, and the report thereon will be found in the Report of the Chief of Engineers, United States Army, for 1895, page 1570 et seq. It is there shown that the commerce of Tampa Bay had assumed considerable proportions; that an increase of the depth of the channel to 24 feet from the entrance to Port Tampa would be of very great advantage to the commercial interests involved, and that it appeared from the information then available that the improvement desired could be effected and maintained at a reasonable expense. All of which is confirmed by the recent survey and the attending investigations, and, in my opinion, this improvement is eminently worthy of being undertaken.

The surveying party and outfit were the same as on the survey of Biscayne Bay. Actual field work began in December, 1896, and was finished in March, 1897. The survey has been plotted on four sheets to a scale of $\frac{1}{10000}$. On a fifth sheet these have been combined and supplemented by the charts of the United States Coast Survey so that the entire bay is shown to a scale of $\frac{1}{50000}$. These maps show that in five localities the channel has a depth of less than 24 feet. These shoals aggregate in length 31,500 feet. The average depth over them varies from 23 feet on the shoal at the entrance to 19.7 feet for a width of 300 feet on Lower Shoal, Old Tampa Bay. The borings indicate that nothing more difficult to dredge than sand and broken shells will be encountered.

Experience in this locality seems to indicate that there will be little difficulty in maintaining the dredged channels. The channels dredged through the two shoals at the entrance to Old Tampa Bay to a depth of 20 feet, where 15 feet formerly existed, were completed more than four years ago, and they seem to have maintained themselves very well. The maximum velocity of the current in the bay, under normal conditions, does not exceed about 2 feet per second. This seems to have very little effect upon the bottom, so that a comparison of early surveys with the recent one shows a remarkably stable condition of affairs.

The mean range of the tide varies from 1.54 feet at Egmont Key at the entrance to the bay to 1.95 feet at Port Tampa. High water at Port Tampa is, on an average, two hours and fifteen minutes later than at Egmont Key.

The gentle slope of the fore shore along the Gulf Coast has the effect of so reducing the height of the storm waves as they approach the land that they do not appear to break until they arrive at a depth of 2 fathoms and less. The shoal at the entrance to Tampa Bay has a depth in excess of 21 feet. From the evidence of experienced pilots and that of Mr. O. N. Bie, who has had local charge of this survey and has had much experience along this coast, having entered this bay during one of the most violent storms known, actual breakers do not exist in that depth of water. From this it would appear that the bottom there is not subject to disturbance due to wave action, therefore a dredged channel through this shoal can confidently be expected to be reasonably permanent without the aid of jetties. In the bay, past

experience has shown that training walls are not required to maintain the channel. A certain amount of dredging may be required from time to time to maintain these channels, as actual results can not be predicted with certainty, but it is believed that the amount of dredging required for this purpose will be very slight.

Upon the assumption that a contract will be authorized for the completion of this work under the continuous-contract system, it is believed that the dredging can be done for 30 cents per cubic yard for that portion of the work on the outer bar and 20 cents per cubic yard for the work in the bay, the following estimate for a channel 24 feet deep at mean low water, 500 feet wide on the bar at the entrance, and 300 feet wide in the bay, has been prepared:

130,000 cubic yards, at 30 cents	$39,000
1,235,000 cubic yards, at 20 cents	247,000
Engineering and contingencies, about 15 per cent of total cost	50,000
Total	336,000

As before stated, it is my opinion that this improvement is worthy of being undertaken, and is earnestly recommended.

The following papers accompany this report:

Report of Mr. J. W. Sackett, assistant engineer.

Copy of report of Mr. O. N. Bie.

Copy of letter of Mr. H. E. Jacobs, auditor Plant System of Rail ways.

Copy of commercial statistics accompanying letter of Mr. Jacobs.

Five tracings in a separate package, being sheets A,* B,* C*, and D*, and a general map of the bay.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Lieut. Col., Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. J. W. SACKETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., June 26, 1897.

COLONEL: I have the honor to submit the following report of the survey of Tampa Bay, Florida, made during the months of December, 1896, and January, February, and March, 1897:

The field party was in local charge of Mr. O. N. Bie, and the personnel was practically the same as in the survey of Biscayne Bay, which immediately preceded this. The U. S. snag boat *Suwanee*, having its own motive power, was used for a quarter boat, etc., as on the preceding survey.

The plan of the survey was based upon the information obtained in the preliminary examination of this bay made in October, 1894, to the report on which, found in Report of Chief of Engineers for 1895, page 1570 et seq., attention is respectfully invited. Detailed surveys were required of all portions of the channel where depths less than 24 feet were found. This involved a scheme of triangulation extending from deep water off the entrance at Egmont Key and the extreme southern end of the bay to Port Tampa, covering an area of about 175 square miles. Of all the Coast Survey stations in that vicinity, descriptions of which had been furnished by the office of the United States Coast and Geodetic Survey, only two could be identified, viz, Egmont Key Light-House and station Palm on the north end of Anna

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* Not printed.

Maria Key. The triangulation was based upon these stations. The progress of the work of triangulation, as well as the other work of the survey, was much interfered with by stormy weather and a hazy condition of the atmosphere. For a detailed account of the survey, reference is invited to the report of Mr. Bie.

The survey has been plotted on four sheets to a scale of $\frac{1}{10000}$ and a map of the entire bay has been made to a scale of $\frac{1}{50000}$. Most of the shore line and the soundings in areas not covered by the four sheets before mentioned have been supplied from Coast Survey chart No. 177.

A tide gauge was established at Egmont Key and referred to a bench mark of the United States Coast Survey at Egmont Key Light-House. The elevation of the plane of mean low water used at that place is from determination by the Coast Survey. Tide gauges were established at a point near Indian Hill, on the east side of the bay, about 15 miles from Egmont Key, on the wharf at St. Petersburg, and at Port Tampa. From the result of these observations the following information has been deduced:

Station.	Mean range of tide.	Mean lunitidal interval.	
	Feet.	*h.*	*m.*
Egmont Key	1.54	XI	VI
Indian Hill	1.73	XII	XLI
St. Petersburg	1.84	XIII	III
Port Tampa	1.95	XIII	XXI

The maximum velocity of the current observed was 1.8 feet per second on the bar, and 2.08 feet per second, on both ebb and flood, at a point in the channel in the bay about 11 miles above Egmont Key.

The improvement desired is a 24-foot channel at mean low water from the Gulf of Mexico to Port Tampa. There appears to be nothing impracticable in the improvement of the channel to that extent. The borings indicate that nothing more difficult to remove than sand and broken shells will be encountered, and previous experience in this bay and elsewhere in harbors along the Gulf Coast has been such that a reasonable degree of permanency may be expected in the dredged channel without the aid of deflecting dikes or jetties. The channels dredged through the shoals at the entrance to Old Tampa Bay to a depth of 20 feet, where 15 feet originally existed, have maintained themselves through a period of four years since the work was completed. The recent survey shows that a depth of 20 feet exists through both cuts. The bar at the entrance to the bay has a depth in excess of 21 feet; hence it is safe to say that the bottom there is not subject to disturbance by wave action, as waves along that coast rarely, if ever, attain dimensions sufficient to cause a disturbance at the bottom in that depth of water.

A comparison between maps of the earliest surveys and the recent survey shows a remarkably stable condition of the bottom at the entrance. For these reasons it is believed that a dredged channel across the bar can be maintained with, at most, only a slight amount of dredging occasionally.

The channel across the bar should have a width of 500 feet, and in the bay 300 feet. Upon that basis, with an allowance of 1 foot extra depth for "back filling," and at the rate of 30 cents per cubic yard on the bar and 20 cents per cubic yard in the bay, the following estimate has been prepared:

130,000 cubic yards, at 30 cents	$39,000
1,235,000 cubic yards, at 20 cents	247,000
Engineering and contingencies, about 15 per cent of total cost	50,000
Total	336,000

For the reasons shown in the report of the preliminary examination previously referred to, particularly in regard to the necessity for a considerable number of the vessels taking phosphate at Port Tampa, to proceed to other ports to complete their cargoes, and considering the magnitude of the commerce of the port, which, according to the statistics furnished by Mr. H. E. Jacobs, auditor of the Plant Steamship Line, amounted to $16,280,157 during the year ending December 31, 1896, it is apparent that this improvement is eminently worthy of being undertaken.

Very respectfully, your obedient servant,

J. W. SACKETT, *Assistant Engineer.*

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

REPORT OF MR. O. N. BIE, MASTER U. S. SNAG BOAT SUWANEE.

UNITED STATES DREDGE SUWANEE,
Tampa, Fla., March 10, 1897.

COLONEL: I have the honor to submit my report of the survey of Tampa Bay, Florida.

After completing the survey of Biscayne Bay I proceeded with the U. S. snag boat *Suwanee* to Tampa, arriving there December 6. The snag boat was hauled out and the bottom scraped, an examination of Hillsboro Bay made, and the actual field work of Tampa Bay survey commenced on December 16, the surveying party consisting of myself, three transitmen, one recorder, and the *Suwanee's* crew.

Base line.—The distance from station Palm, on the north end of Anna Maria Key, to Egmont Light-House, as previously determined by the United States Coast and Geodetic Survey, was used as a base line for a system of triangulation extending to Port Tampa. At the upper end of this system, between Port Tampa and Gadsdens Point, a check base line, 10,898.04 feet, was carefully measured and remeasured with a 100-foot steel tape. A 16-pound pull registered on a spring balance attached to the end of the tape was used in measuring, and correction for catenary curve computed. In remeasuring, the distance checked within 0.25 foot. The distance as computed from station Palm and Egmont Light-House base line for this check base line and the measured distance were found to agree satisfactorily.

Soundings.—The area of the survey covers the ship channel and adjacent shoals from Port Tampa to Buoy No. 6, off Piney Point, about 87 square miles, and the north channel from Mullet Key to the whistling buoy, with adjacent shoals, about 40 square miles. The intervening distance has over 24 feet depth at mean low water, and no survey was necessary. About 30,000 soundings were taken.

Borings.—Thirteen borings, ranging in depth from 30 to 33 feet, were taken at different parts of the channel, and no rock was found. The material along the channel consists of hard sand, which, in some places, is underlaid at a depth of 28 feet with a mixture of mud and sand. I am satisfied that no rock would be found along the channel from the bar to Port Tampa at a less depth than 30 feet.

Tidal observations.—Tidal observations were taken at Egmont Wharf, Indian Hill, St. Petersburg, and Port Tampa. The plane of mean low water established by the United States Coast and Geodetic Survey was used in making soundings on the survey of the bar, but mean low water at the other places was obtained from our tidal records, which, at Indian Hill and Port Tampa, extended over a period of six weeks, and at St. Petersburg eight weeks. The mean range of tides deduced from these observations is: Egmont, 1.54 feet; Indian Hill, 1.73 feet; St. Petersburg, 1.84 feet, and Port Tampa, 1.95 feet. Permanent bench marks were established at these places.

Current observations.—Current observations were taken during one flood and one ebb tide with a pole float on the bar and at Piny Point buoy, and direction and velocity noted every half hour. The maximum velocity observed at Piny Point buoy was 2.08 feet per second on both ebb and flood and 1.8 feet per second on the bar.

Maps.—Four maps to a scale of $\frac{1}{10000}$ were partly made and forwarded to your office to be completed.

I am indebted to Capt. Oscar C. Hamlet and officers of the U. S. practice ship *Chase* for the use of their steam launch and for tidal observations day and night for about eight weeks, and also to Mr. H. E. Jacobs, auditor Plant Steamship Line, for accompanying statistics.

Very respectfully, your obedient servant,

O. N. BIE, *Master.*

Lieut. Col. W. H. H. BENYAURD,
Corps of Engineers, U. S. A.

LETTER OF MR. H. E. JACOBS, AUDITOR PLANT STEAMSHIP LINE.

PLANT SYSTEM,
Port Tampa, Fla., January 15, 1897.

DEAR SIR: As requested in your letter of the 4th instant to Mr. John Bradley, agent, I have prepared commercial statistics for Tampa Bay for the year 1896, as has been customary in the past.

The tonnage figures are approximately correct, with the exception that I have estimated the traffic by the steamer *Manatee* at 3,000 tons and have also estimated the fish and oysters after consulting with the freight and express agents in Tampa and at this point. I have given the phosphate and coal in short tons, 2,000 pounds, which will conform with the other articles.

I also take pleasure in handing you statement of our phosphate shipments for the year.

Yours, very truly,

H. E. JACOBS, *Auditor.*

Mr. O. N. BIE,
In charge of Survey of Tampa Bay.

COMMERCIAL STATISTICS.

Commerce of Tampa Bay, Florida, year ending December 31, 1896.

[Furnished by the Plant Steamship Line, Port Tampa, Fla.]

Articles.	Gross tonnage.	Estimated value.
Fertilizers	1,000	$30,000
Fruits	400	20,000
Grain	1,200	300,000
Flour, meal, and grits	7,200	288,000
Merchandise	45,015	11,253,750
Oranges	1,025	76,902
Phosphate rock	77,200	689,290
Phosphate pebble	120,213	1,073,333
Vegetables	3,275	163,542
Fish and oysters	3,000	120,000
Tobacco	1,100	2,200,000
Coal	15,960	63,840
Bananas	50	1,500
Total	276,638	16,280,157

Tobacco receipts discontinued May 27, account Government prohibition. Habana trade trifling. Very heavy decrease in traffic to Cuba.

Arrivals and departures of vessels for the year ending December 31, 1896.

Kind of vessel.	Arrivals.		Departures.	
	No.	Tons.	No.	Tons.
Steamers	1,857	534,944	1,857	534,944
Sailing vessels	87	88,400	87	88,400
	30	2,400	30	2,400
Total	1,974	625,744	1,974	625,744

Estimated number of passengers carried by water..... 42,400
Estimated percentage of total trade of neighborhood carried by water.....per cent.. 75

H. E. JACOBS, *Auditor.*

PORT TAMPA, FLA., *January 15, 1897.*

APPENDIX P.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN GEORGIA AND FLORIDA AND IN EASTERN ALABAMA.

REPORT OF MAJ. F. A. MAHAN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Carrabelle Bar, Florida.
2. Apalachicola Bay, Florida.
3. Apalachicola River, the Cut-off, and Lower Chipola River, Florida.
4. Flint River, Georgia.
5. Chattahoochee River, Georgia and Alabama.
6. Choctawhatchee River, Florida and Alabama.
7. Pensacola Harbor, Florida.
8. Escambia and Conecuh rivers, Florida and Alabama.
9. Alabama River, Alabama.
10. Coosa River, Georgia and Alabama.
11. Operating and care of canals and other works of navigation on Coosa River, Georgia and Alabama.

SURVEY.

12. Apalachicola Bay, Florida, and approaches to Apalachicola.

UNITED STATES ENGINEER OFFICE,
Montgomery, Ala., July 10, 1897.

GENERAL: I have the honor to forward herewith annual reports for the river and harbor works under my charge * * * for the fiscal year ending June 30, 1897.

* * * * * * *

Very respectfully, your obedient servant,

F. A. MAHAN,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

P 1.

IMPROVEMENT OF CARRABELLE BAR AND HARBOR, FLORIDA.

DESCRIPTION.

The town of Carrabelle is situated about 20 miles east of Apalachicola, on Carrabelle or Crooked River, which empties into the north side of the St. Georges Sound. The river forms the inner harbor, which has a channel along the water front of the town varying in depth from 9 to 15 feet, with a width of 100 feet.

A bar, 1 mile wide from the 10-foot contour inside to the same depth outside, with a depth not more than 3 to 4 feet at low water, obstructs the passage in either direction.

PROJECT OF IMPROVEMENT.

The river and harbor act of June 3, 1896, appropriated $10,000 to be expended in making a 10 foot channel from the mouth of the Carrabelle River to the channel in the bay. No estimate of the cost of this work has ever been submitted.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1897.

A contract approved on June 11, 1897, was made with the Rittenhouse Moore Dredging Company, of Mobile, Ala., to cut the channel 10 feet deep, provided for by the river and harbor act of 1896. The contract provides for work to begin July 1, 1897, and to end October 1, 1897.

RECOMMENDATIONS AND ESTIMATES.

The commerce of this place was valued in 1895 at $600,000. It will increase, beyond doubt, with better facilities of access to the inner harbor. The present appropriation will give a channel 53 feet wide. This width is insufficient, but it is all that can be had under the terms of the act, which specifies the depth of 10 feet. It would have been better for the place had the act allowed a greater width and less depth.

An appropriation of $10,000 could be expended judiciously in widening the channel.

Money statement.

July 1, 1896, balance unexpended	$10,000.00
June 30, 1897, amount expended during fiscal year	207.54
July 1, 1897, balance unexpended	9,792.46
July 1, 1897, amount covered by uncompleted contracts	9,210.00
July 1, 1897, balance available	582.46
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	10,000.00

APPROPRIATIONS.

June 3, 1896	$10,000

Abstract of bid received and opened on March 13, 1897, by Maj. F. A. Mahan, Corps of Engineers, for dredging on Carrabelle Bar, Florida.

No.	Name and address of bidder.	Time of commencing.	Time of completion.	Price per cubic yard.
1	Rittenhouse Moore Dredging Co., Mobile, Ala	July 1, 1897	Oct. 1, 1897	$0.30

Contract in force.

No.	Name and address of contractor.	Date of approval.	Date of beginning work.	Date of completion of work.
1	Rittenhouse Moore Dredging Co., Mobile, Ala	June 11, 1897	July 1, 1897	Oct. 1, 1897

COMMERCIAL STATISTICS.

The commercial statistics for the harbor of Carrabelle, Fla., are so combined with those of Apalachicola Bay, Florida, that a separation is impossible.

P 2.

IMPROVEMENT OF APALACHICOLA BAY, FLORIDA.

DESCRIPTION.

Apalachicola Bay is a long, broad, and shallow sheet of water on the south coast of Florida. It is separated from the Gulf of Mexico by St. Vincents Island, Sand Island, and the west half of St. Georges Island. The bay, when continued to the eastward, forms St. Georges Sound, which is separated from the Gulf by the eastern half of St. Georges Island, by Dog Island, and by Dog Island Reef.

The line dividing Apalachicola Bay from St. Georges Sound runs from Cat Point, on the north shore, to Bulkhead Point, on St. Georges Island. On this line is found Bulkhead Shoals.

Access to Apalachicola Bay can be had through West Pass, between St. Vincents Island and Sand Island. This pass is rarely used, as there is no good anchorage inside.

The entrance to St. Georges Sound is through East Pass, between St. Georges and Dog islands.

Apalachicola Harbor is the deep water just inside of East Pass and north of Dog Island.

ORIGINAL CONDITION.

Apalachicola River enters Apalachicola Bay at about the middle of its north side. A bar exists at the mouth of the river. The depth of the water on it was originally about 3.5 feet. The width of bar between the 8-foot curves inside and outside varies; it averages 7,000 feet in round numbers.

The depth of water across Bulkhead Shoals was originally less than 4 feet.

PROJECT OF IMPROVEMENT.

The report of the examination of Apalachicola Bay is to be found in the Report of the Chief of Engineers for 1879, page 823. This report recommended that a channel 100 feet wide and 11 feet deep should be dug through the bar at the mouth of the river. If the results obtained by this cut were such as to warrant its enlargement, it was recommended that the width be increased to 200 feet. This project was approved; the cost was estimated at $100,000.

A survey of the mouth of the river and of the eastern part of Apalachicola Bay was made in 1891. As the results of this survey the above project was again recommended, and to it was added the recommendation that a channel 9 feet deep and not less than 100 feet wide should be cut through Bulkhead Shoals.

OPERATIONS TO JUNE 30, 1896.

The channel through the bar at the mouth of the river has never been obtained as recommended, owing to the insufficiency of appropriations. The width has never exceeded 100 feet; the depth has never exceeded 9.5 feet, as against 11 feet proposed.

The first cut was made during the winter of 1881 and 1882. It was begun at 11 feet inside the bar, and the depth of 11 feet was maintained for a length of 5,748 feet. Of this length, 1,967 feet was 60 feet wide; 3,781 feet was but 30 feet wide. During 1883 the 30-foot cut was widened to 60 feet and extended to the 9.5-foot curve outside the bar. An addi-

tional cut 15 feet wide was made through the bar. Work done during 1884 left the channel in the following condition:

Average depth, 9.5 feet; total length, 6,060 feet, of which 5,200 feet was 75 feet wide and 860 feet 60 feet wide. During the spring of 1885 the cut was partly reopened, it having filled up to an available depth of 6 feet. The reopening was made 4,177 feet long, 60 feet wide, and 9.5 feet deep.

During 1887 and 1888 the cut was reopened with the following dimensions: Length, 3,635 feet; width 60 feet; depth, 9 feet.

An examination made in March, 1889, showed that the cut had shoaled to 4 feet in depth. The cut was reopened between November, 1889, and May, 1890, to a depth of 8 feet, with a length of 6,000 feet and a width varying from 80 to 90 feet. The cut was again reopened between November, 1892, and April, 1893, with these dimensions: Five thousand three hundred and fifty feet long, 120 feet wide at inner end and 100 feet at outer end, 8 feet deep.

An examination made in April, 1894, showed that the channel had shoaled, since the reopening in 1892–93, 2.5 feet for a length of 2,000 feet near the inner end.

A new cut 4,930 feet long, 100 feet wide, and 8 feet deep at low water was dug during January and February, 1896.

A straight cut 4,000 feet long, 120 feet wide, and 9 feet deep was made across Bulkhead Shoals in October, 1891, to February, 1892. An examination of this cut made in June, 1895, shows no filling up, and none has been reported since then by those who are using the cut constantly.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1897.

A contract was made with the Rittenhouse-Moore Dredging Company, of Mobile, Ala., to reopen the cut through the bar. This contract was approved April 26, 1897. Work was begun on May 26, 1897, and finished June 28, 1897. The amount of dredging was 45,000 cubic yards. This is the fifth time this cut has been reopened. Its proposed dimensions have never been reached.

CONDITION OF IMPROVEMENT JUNE 30, 1897.

The cut through the bar at the mouth of the river has a bottom width of 50 feet and a depth of 8 feet at mean low water.

The cut through Bulkhead Shoals remains in good condition.

It is too soon to determine how well the depth of this new cut will be maintained, but there is nothing, apparently, to cause hopes of better results than those obtained heretofore, viz, that to maintain the channel through the bar at the mouth of the river at its present dimensions requires the removal of 50,000 to 60,000 cubic yards of material annually.

The project for opening the bar has never been carried out, consequently it is impossible to say what the result might be if the channel were ever once opened to its full dimensions. The chances are altogether in favor of its closing up again.

RECOMMENDATIONS AND ESTIMATES.

The commerce of Apalachicola demands a deeper and wider channel. Past experience has shown that the shallow channels dug heretofore (the only ones which the meager appropriations have permitted) have

filled up very soon after being finished. It is possible that a wider and deeper channel, say 200 feet wide and 11 feet deep, might stand a better chance for remaining permanent. Such a channel would require the removal of 200,000 cubic yards, in round numbers, of mud, at a cost of $40,000. A longitudinal training wall along the left bank of the river might be of material assistance in keeping the channel open. Whatever improvement may be adopted, it seems clear that more or less dredging will have to be done every year.

An appropriation of $40,000 can be expended judiciously on this work during the year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended		$12,270.45
June 30, 1897, amount expended during fiscal year		1,462.98
July 1, 1897, balance unexpended		10,807.47
July 1, 1897, outstanding liabilities	$305.83	
July 1, 1897, amount covered by uncompleted contracts	9,726.04	
		10,031.87
July 1, 1897, balance available		775.60
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		40,000.00

APPROPRIATIONS.

The following amounts have been appropriated from time to time for this bay:

March 2, 1833	$8,700	August 11, 1888	$20,000
July 4, 1836	10,000	September 19, 1890	20,000
March 3, 1839	9,900	July 13, 1892	20,000
June 14, 1880	10,000	August 18, 1894	15,000
March 3, 1881	10,000	June 3, 1896	12,000
August 2, 1882	25,000		
July 5, 1884	10,000	Total	182,600
August 5, 1886	12,000		

These appropriations were divided into two periods, separated by an interval of forty-one years, viz: From 1833 to 1839, $28,600; from 1880 to 1896, $154,000.

Abstract of bid received and opened on March 13, 1897, by Maj. F. A. Mahan, Corps of Engineers, for dredging in Apalachicola Bay, Florida.

No.	Name and address of bidder.	Time of commencing.	Time of completion.	Price per cubic yard.
1	Rittenhouse Moore Dredging Co., Mobile, Ala	Apr. 1, 1897	June 30, 1897	$0.24

COMMERCIAL STATISTICS.

The following information has been furnished by Mr. J. C. Grady, collector of customs and president of board of trade of the port of Apalachicola, Florida:

Apalachicola is a port of entry located at the mouth of the Apalachicola River and bay of same name, is the county seat of Franklin County, and has about 5,000 inhabitants.

Emptying into the Apalachicola River are the Chattahoochee, Flint, and Chipola rivers, also many creeks and streams on which are located almost inexhaustible

quantities of the finest cypress, pine, ash, oak, and other timber, which are brought to Apalachicola to market.

The Chattahoochee and Flint rivers, which empty into the Apalachicola, are navigable to Columbus, Ga., and Bainbridge, and the only drawback to this port is the lack of deep water.

Apalachicola is the natural outlet for all of Georgia and Alabama bordering on the rivers, and if this port is opened and the proposed channel complete it would be the saving of many thousands of dollars to Georgia, Alabama, and Florida. The three rivers named are navigated by four lines of steamers from Apalachicola to Columbus, Ga., a distance of 360 miles.

Congress in 1896 ordered a survey for an 18-foot channel at mean low water from the docks at Apalachicola to the gulf westward, and that survey has been made, and it is estimated that it will not take over $350,000 to complete the project, which is a small sum compared to the benefit it would be to commerce, the customs revenue that will accrue to the United States, and the saving of thousands of dollars to the citizens of Georgia, Alabama, and Florida.

Since this survey has been made and announced, Apalachicola has attracted considerable attention, and one line of railroad, the Florida Western, has been partially built eastward to connect with Tallahassee and Thomasville, and the work is being pushed ahead. Another line of road is now contemplated and the company organized to run westward to connect with the Louisville and Nashville, and the fact of a survey for an 18-foot channel having been made, and a hope for the speedy completion of this channel, has done much to increase the population and prosperity of Apalachicola.

About all the timber and lumber shipped from the district of Apalachicola comes down the Apalachicola River and has to be towed down to East Pass, a distance of 25 miles, and across East Pass, which at times is so rough that it is impossible to cross, causing delay and loss of timber, which all could be prevented if the proposed channel from the docks of Apalachicola westward to the Gulf was completed.

It is estimated, and safely so, that between $75,000 and $100,000 per annum would be saved to the lumber merchants and vessels in towage, labor, and loss of timber if this channel is completed.

The natural run of the current is to the westward, and the whole line of route to the Gulf is landlocked. Fronting and running near the docks and above and below Apalachicola for 5 miles or more we have about 22 feet of water which would make the best of loading berths for vessels.

The naval stores business is also being diverted this way, and when this channel is completed, so as to save the enormous expense of lighterage and towage, I make the assertion that Apalachicola will at once return to her prosperity as in 1860, when the commerce was over $14,000,000, and that the United States will receive a large income from customs duties.

Below I append a statement of commerce as made up from custom-house statistics and other estimated information:

	Number.	Tonnage.
Vessels entered from—		
United States ports	27	.....
Africa	15	.....
West Indies	38	.....
Brazil	26	.....
England	14	.....
Mexico	9	.....
France	4	.....
Argentine Republic	4	.....
Total	137	70,790
Vessels cleared for—		
United States ports	58	.....
West Indies	6	.....
England	38	.....
France	4	.....
Argentine Republic	19	.....
Germany	13	.....
Total	138	73,787
Number of sailing vessels arrived which do not enter and clear at custom-house	114	12,500
Number departed	119	13,500
Estimated arrivals and departures of steamers plying the Flint and Chattahoochee rivers	750	89,600
Number of vessels engaged in traffic at Apalachicola	150	.....

Amount of superficial feet of cypress and pine lumber shipped		61,000,000
Turpentine	casks	10,000
Rosin	barrels	35,000
Fish and oysters	do	30,000
Estimated value of all merchandise shipped from Apalachicola, which includes many articles not named above		$1,871,000
Imports through the same and other classes of trade		1,976,000
Total commerce generally		3,847,000

The lumber trade, which has increased largely over 1896, would have been much larger but for the trouble in Cuba, and as soon as that is settled we expect, on account of our nearness to the island, to ship large quantities there as in days gone by.

P 3.

IMPROVEMENT OF APALACHICOLA RIVER, THE CUT-OFF, AND LOWER CHIPOLA RIVER, FLORIDA.

A reconnaissance of this river was made between November 29, 1872, and February 1, 1873. The report of this reconnaissance will be found in the Report of the Chief of Engineers for 1873, pages 698–699.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENT.

The Apalachicola River is formed by the junction of the Chattahoochee and Flint rivers at the extreme southwest corner of the State of Georgia. It runs southwardly through the State of Florida and empties into Apalachicola Bay at the city of Apalachicola. It passes through the low, swampy country overflowed annually by the freshets in the Chattahoochee and Flint. This annual overflow prevents the country adjacent to its banks from being used to any great extent for agricultural purposes. Plenty of timber, however, is to be found on both sides of the river.

The most serious obstacle to navigation found was at Moccasin Slough, 47 miles above the city of Apalachicola. During the civil war the Confederate authorities had placed obstructions here to prevent vessels belonging to the United States ascending the river. These obstructions caught trees, logs, and other floating materials to such an extent as to form an actual dam. The river, however, cut off from its natural course, forced a passage from about a mile and a half above the obstructions to the River Styx. This passage was 3,100 feet in length. Reaching the Styx, the water of the Apalachicola River followed it down a distance of three-quarters of a mile until it reached the original river again. It was very difficult to obtain an entrance to the slough by vessels coming down the river, for the reason that the slough bent abruptly, forming an angle of about 180°, and ran in exactly the reverse direction to the current of the river. Moreover, it is only from 80 to 100 feet in width, is very crooked, and has a swift current of more than 5 miles an hour, due to a fall of 2.8 feet. The passage through the slough and the river Styx is 2 or 3 miles shorter than the old channel through the Apalachicola River proper.

The depth of the water in the river from the junction of the Chattahoochee and Flint to Apalachicola is at all places more than 6 feet. Its length is about 105 miles, its width is about 150 to 200 yards.

Every freshet from the Chattahoochee or Flint causes more or less obstruction to navigation by the lodgment of snags and logs in the Apalachicola River.

PROJECT.

The original project, submitted in 1873, was to widen and straighten Moccasin Slough and to remove all snags from the river, at an estimated cost of $80,333.

The act of August 11, 1888, directed an examination of the "Chipola River from its mouth to Wewahitchka, and the Cut-off, and Lee Slough, running from the Apalachicola River to the Chipola River." As a result of this examination, made in 1889, the original project was extended so as to include a channel 60 feet wide and 5 feet deep through the Cut-off, Lee Slough, and lower Chipola River.

OPERATIONS TO JUNE 30, 1896.

A fairly complete synopsis of the work done on this river from January 1, 1875, to June 30, 1895, will be found in the Report of the Chief of Engineers for 1896, part 2, pp. 1348–1350.

No work was done during the year ending June 30, 1896, because there was no money.

CONDITION OF THE IMPROVEMENT JUNE 30, 1896.

The channel was completely opened to navigation, except scattered logs and snags which caused trouble at low water. Overhanging timber and some sharp bends of the river at the Elbows and Moccasin Slough, which retard boats at all stages of water, remained to be removed.

The channel through the Cut-off and lower Chipola River was opened to a width of 50 feet in its narrowest portions, but was too crooked to admit of safe navigation at low water.

OPERATIONS DURING THE YEAR ENDING JUNE 30, 1897.

The snag boat *Flint* was transferred from the Chattahoochee to the Apalachicola, and began work on the latter river on November 1, 1896. Operations were continued to January 31, 1897. The work done was the removal of overhanging trees, of drift trees on the banks, of logs and snags, of stumps, and of bushes from the Cut-off, from the lower Chipola, and from the Apalachicola River proper.

This work was divided as shown in the following table:

	Overhanging trees.	Drift trees on bank.	Logs and snags.	Stumps.	Bushes.
Cut-off	266	5	12	14	.....
Lower Chipola	376	463	433	572	656
Apalachicola	878	460	179	43	550
Total	1,520	928	624	629	1,206

To facilitate the pulling of stumps 52 blasts, using 192 pounds of dynamite, were fired in the Apalachicola River; and 137 blasts, requiring 245 pounds of dynamite, were fired in the lower Chipola River.

The snag boat *Flint* was repaired, at a cost as follows:

Use of marine ways	$170.00
Lumber	70.00
Bolts, nails, oakum, and paint	10.00
Wages	218.00
Subsistence	26.03
Total	494.03

The channel work cost:

Engineering and superintendence	$575.00
Labor	1,460.75
Subsistence	334.29
Current repairs	180.00
Dynamite, fuses, etc	141.65
Machinists' supplies	45.46
Fuel	118.50
Total	2,855.65

REMARKS.

Mr. Thomas Robinson, the assistant engineer of this river, says: "It was expected from appearances of the soil during the earlier work that the banks of the narrower portion of the lower Chipola would erode readily, as soon as the timber was removed. Experience shows, however, that the older silt, a few feet back from the margin of the stream, has assumed a clay-like consistency and is not easily acted upon by the current. If the channel through the old (Lee Slough) portion is to be further widened, a dredge of some sort must be applied to the work. Since this river forms, together with the Flint and Chattahoochee, one system of waterways, it would be economical to provide a dredge, jointly, for use on all these improvements."

I agree with Mr. Robinson that a dredge is a necessity for these streams.

RECOMMENDATION AND ESTIMATES.

The country bordering on the Apalachicola River depends almost entirely upon the river for its transportation. The completion of the improvement is essential to the development of the region.

There is still required $6,000 for the completion of the improvement. Of this amount $2,000 will complete the clearing of the Cut-off and lower Chipola River, according to the approved project of 1890; $2,000 will finish the improvement of Moccasin Slough and the Elbows, and $2,000 will be required to maintain the improvement. No special working plant is required for this river, as the snag boat of the Flint and Chattahoochee rivers can be used here when not in use elsewhere.

It is recommended, therefore, that $6,000 be asked for the completion of the work on this river and for maintenance during the fiscal year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended	$5,276.51
June 30, 1897, amount expended during fiscal year	3,823.63
July 1, 1897, balance unexpended	1,452.88
July 1, 1897, outstanding liabilities	50.00
July 1, 1897, balance available	1,402.88
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	6,000.00

APPROPRIATIONS.

May 23, 1828	$3,000	July 5, 1884	$1,000
April 23, 1830	2,000	August 5, 1886	1,000
March 2, 1831	8,000	August 11, 1888	2,000
June 23, 1874	10,000	September 19, 1890	2,000
March 3, 1875	10,000	July 13, 1892	5,000
June 18, 1878	8,000	August 18, 1894	5,000
March 3, 1879	5,000	June 3, 1896	5,000
June 14, 1880	2,000		
March 3, 1881	1,500	Total	72,500
August 2, 1882	2,000		

COMMERCIAL STATISTICS.

The commercial statistics of the Apalachicola River are so combined with those of the Chattahoochee and Flint rivers that a separation is impossible, and reference is made to the Flint River for figures.

P 4.

IMPROVEMENT OF FLINT RIVER, GEORGIA.

DESCRIPTION.

The Flint River rises about 20 miles southwest of Atlanta, in Georgia, runs nearly due south, bending a little toward the eastward, and finally joins the Chattahoochee River at the extreme southwest corner of the State of Georgia. The junction of these two streams forms the Apalachicola River. A survey was authorized by the river and harbor act of June 10, 1872. The survey was begun at Albany, Ga., in November, 1872, and finished in May, 1873. Obstructions to navigation on the Flint River were rock shoals formed chiefly of loose rocks of various sizes, becoming more frequent in going up the river. The character of the bed, while increasing the cost of the work, will tend to make it more permanent.

PROJECT.

The project for this work proposes a channel 100 feet wide, with a depth of 3 feet at extreme low water, from Chattahoochee, Fla., to Newton, Ga., a distance of 71¾ miles, at an estimated cost of $118,105; and from Newton, Ga., to Albany, Ga., a distance of 33¼ miles, at an estimated cost of $66,757, making a total of $184,862 for a distance of 105 miles.

The river and harbor act of June 18, 1878, called for an examination of the Flint River between Albany and Montezuma, Ga. This examination showed that the removal of logs and snags and overhanging trees throughout the entire distance, estimated at 77 miles, would give a navigable channel for light-draft steamers throughout the greater part of the year.

This work was estimated to cost $15,100.

OPERATIONS TO JUNE 30, 1896.

A summary of operations to June 30, 1895, will be found in the report of the Chief of Engineers for 1896, part 3, pp. 1352–1354.

1896.—Above Albany, Ga.—Nothing was done.

1896.—Below Albany, Ga.—Work was begun in August, and the channel was finished through Sisters Islands and Buck Shoals for a distance of 2¼ miles, with the removal of 1,510 cubic yards of rock and 67 snags from the channel, 12 trees trimmed on the banks, and 842

cubic yards of rock deposited in spur dikes. In December, 1896, the drilling barge was taken to Bacouton, Ga., and laid up for the winter.

CONDITION OF IMPROVEMENT JUNE 30, 1896.

Above Albany.—As no commerce was attempted during the year on this part of the river, no examination of its condition was made; it may be assumed, however, that it was bad.

Below Albany.—There was a navigable channel at all seasons of the year between Albany and Buck Shoals, a distance of 37 miles. Between Buck Shoals and Bainbridge, a distance of about 38 miles, navigation at low water was impossible on account of rocks. Below Bainbridge the river was navigable at all seasons by boats plying the Chattahoochee and Apalachicola rivers.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

At the beginning of the fiscal year the working plant was in charge of watchmen at Tea Cup Shoals, near Baconton, Ga. In August, under the new appropriation, the crew were called in, and the drilling barge was drifted down the river to Buck Shoals, clearing scattered logs and bowlders as it passed. Here the boat worked one month. It was then drifted to Baggs Ferry Shoals and worked six weeks. In November it was moved down to Dickersons and Dry Bread shoals, where it worked until high water. The boat was then warped back up river 19 miles to Baconton, and was put in charge of watchmen until close of the fiscal year. During the months of September and October a transitman was employed, and by the help of men from the crew of the drilling barge surveys were made of Rope Work Shoals and Bull Slough, with a view to formulating a plan for their improvement.

The obstructions removed by the drilling barge were:

	Rock.	Logs and snags.	Trees trimmed on bank.	Cubic yards of rock placed in spur dikes.
	Cub. yds.			
Buck Shoals	514	47	4	288
Baggs Ferry	545	.....	.....	434
Dry Bread and Dickersons shoals	*a* 434	4	.....	120
Scattering	17	30	8	.....
Total	1,510	81	12	842

a Incomplete.

The cost of work was:

Engineering and traveling expenses	$792.88
Watchmen (seven months)	420.00
Superintendence	360.00
Labor, including subsistence	2,688.77
Tools, dynamite, rope, lumber, etc	338.50
Total	4,600.15

REMARKS.

In carrying on the work with present appliances, the bowlders are first broken by blasting. When the water is not too deep the fragments are removed by men wading in the stream, who hand them to their comrades upon the dumping flat. When the water is too cold or too deep for wading, grappling tongs are used to load the flat. The removal of rock in this way cost $2 per cubic yard. The price varies, however, with the condition of the stream during the working season. Men

wading when the water is not over 4 feet deep will pick up by hand three times as much rock as they can grapple with tongs in 6 feet of water. A small dredging machine would handle this material more readily than it is possible with the present manual appliances, and would effect a saving of 75 per cent of the cost if it removed the obstructions as readily as it is believed it would; that is to say, an outlay of $6,000 for a dredge out of an appropriation of $8,000 would remove as much rock as the present method, and leave a good machine on hand for further work.

The drilling barge and dumping flat were built in 1889. The hulls of both are so badly decayed that it would be wiser and more economical to build new hulls than to attempt to repair the old ones.

RECOMMENDATIONS AND ESTIMATES.

There is no question as to the advisability of continuing the improvement of this river from the mouth to Bainbridge. There is a stretch of bad river between Newton and Bainbridge which can be navigated with care during moderate stages, but it is impracticable at low water. As the low-water season is that of the removal of the cotton crop, the best trade of the year is lost to navigation. There is no doubt that if the river were in good condition at low water there would be a considerable increase in the commercial movement.

It is recommended, therefore, that the work be continued hereafter as it has gone on in the past, except that a dredge and dump scows be built for the use of the Flint and Chattahoochee rivers, at a cost of $15,000, one-half of the cost being borne by each river.

The estimated cost of what is required for judicious expenditure during the coming year on this river is:

Five months of the snag boat *Flint*	$5,000
Eight months of the drilling barge	8,000
New hulls for the drilling barge and flatboat	6,000
Dredging machine and two barges (one-half)	7,500
Total	26,500

Money statement.

July 1, 1896, balance unexpended	$8,938.35
June 30, 1897, amount expended during fiscal year	5,019.45
July 1, 1897, balance unexpended	3,918.90
July 1, 1897, outstanding liabilities	5.94
July 1, 1897, balance available	3,912.96
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	26,500.00

APPROPRIATIONS.

For Chattahoochee and Flint rivers:	
June 25, 1874	$25,000
March 3, 1875	25,000
August 14, 1876	20,000
Total	*70,000
June 18, 1878	10,000
March 3, 1879	7,000
June 14, 1880	20,000
March 3, 1881	$15,000
August 2, 1882	25,000
July 5, 1884	20,000
August 5, 1886	20,000
August 11, 1888	20,000
September 19, 1890	20,000
July 13, 1892	15,000
August 18, 1894	8,000
June 3, 1896	8,000
Total	188,000

*Of this amount $18,000 was expended on the Flint River.

COMMERCIAL STATISTICS.

A small steamer, *Little Vixen*, 20 tons register, 12 inches light draft and 24 inches loaded, made some trips between Bainbridge and Chevertown, but no statistics could be obtained.

A new steamer, the *J. P. Williams*, 75 tons register, 18 inches light draft and 30 inches loaded, made trips between Bainbridge and Newton, Ga.

For the Flint River alone the following statistics have been received:

Stern-wheel steamboat.	Registered tonnage.	Draft.		Round trips.	Between what points.
		Light.	Loaded.		
		Inches.	*Inches.*		
Maud Alma	35	10	18	17	Albany, Newton, and Bainbridge, Ga.

Freight carried.

Articles.	Quantity.	Tons.
Cotton ..... bales	150	38
Cotton seed ..... sacks	300	3
Fertilizers ..... do	1,500	150
Hides and skins ..... bales	50	1
Live stock ..... head	40	2
Lumber ..... feet	50,000	100
Staves ..... pieces	45,000	50
Provisions ..... packages	15,000	750
Grain ..... sacks	2,000	100
Miscellaneous freight ..... packages	500	30
Naval stores ..... barrels	12,000	1,800
Total	.....	3,024

Estimated value of above freight, in round numbers, $195,000.

Between Bainbridge and the mouth of the river the stream is well used by the steamers plying the Chattahoochee and Apalachicola rivers, and for the commerce of this section of the river reference is made to the following table:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Number of passengers.
		Light.	Loaded.		
		Feet.	*Feet.*		
Naiad	173.44	2	3.5	25	1,954
Queen City	154	2	4.5	24	2,845
Flint	135.57	1.5	4	35	2,510
Apalachee	161.90	2.3	4.5		
Fannie Fearn	179.32	2.6	5	8	1,092
Bay City	185.64	1.8	3.6	7	644

City of Columbus sunk in March, 1897. No returns by owners.

J. F. C. Griggs sunk in April, 1897. No returns by owners.

Amount of lumber rafted down the river is not known, but is covered in the report for Apalachicola Bay, Florida.

Freight carried.

Articles.	Quantity.	Tons.
Cotton ..... bales	9,403	2,350
Cotton seed ..... sacks	1,811	181
Fertilizers ..... do	48,147	4,814
Hides and skins ..... packages	35	4
Live stock ..... head	261	78
Lumber ..... feet	360,000	1,089
Provisions ..... packages	104,879	3,670
Grain ..... sacks	31,541	2,365
Miscellaneous freight ..... packages	181,696	5,905
Naval stores ..... barrels	37,201	8,930
Shingles	5,173	1,141
Brick	170,971	427
Total	.....	30,854

Estimated value of above freight, in round numbers, $1,967,000.

P 5.

IMPROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAMA.

GENERAL IMPROVEMENT.

Description and condition before improvement.—The Chattahoochee River rises in the extreme northern part of Georgia, whence it flows southwestwardly until it strikes the boundary line between Georgia and Alabama, at West Point, Ga.; thence it flows nearly due south, forming the boundary line between the States of Georgia and Alabama, and, farther on its course, between Georgia and Florida, until it joins the Flint, forming the Apalachicola River. The river does not become navigable until it reaches Columbus, Ga., an estimated distance of 224 miles above its junction with the Flint. Between these two points there are more or less of obstructions to navigation, but the records of this office are so incomplete that it is impossible to give any detailed information on the subject between Columbus and Eufaula.

The report of the survey of the Chattahoochee River, shown on pages 584, 585, Report of the Chief of Engineers for 1872, contains an estimate for the improvement of the Chattahoochee and Apalachicola rivers from Columbus, Ga., to Apalachicola, Fla., at a cost of $464,000. No project is made in that report.

In the report of the Chief of Engineers for 1873, page 700, three estimates were presented, as follows:

1. For removal of snags, logs, and loose rocks, insuring a 4-foot channel between Eufaula, Ala., and the junction of the Flint at low water, $63,333.

2. For straightening and widening this 4-foot channel to 100 feet, $81,914.

3. For deepening this channel to 6 feet at low water, 100 feet wide, $982,945.

The engineer officer then in charge of the improvement of the river stated in his annual report—

> I consider the improvement included in estimates Nos. 1 and 2 sufficient for the requirements of navigation. * * *

This would make the estimated cost of the improvement of this part of the river $145,247.

No estimate has been found of the cost of the portion between Columbus, Ga., and Eufaula, Ala.

PROJECT.

The project then adopted, and which is still in force, provides for a low-water channel 4 feet deep and 100 feet wide from Columbus, Ga., to Chattahoochee, Fla., an estimated distance of 224 miles, by the removal of snags and logs from the channel and overhanging trees from the banks, cutting a channel through the rock shoals, and deepening sand bars by works of contraction and shore protection.

OPERATIONS TO JUNE 30, 1896.

A summary of the work done on this river from 1874 to June 30, 1895, is to be found in the Report of the Chief of Engineers for 1896, part 3, pages 1357–1361.

1896.—The snag boat *Flint* started from Chattahoochee, Fla., on July 1, 1895, and cleared the river of all accessible snags up to Columbus,

Ga. Work was suspended on August 15, for the lack of funds, and the plant laid up.

A bad breach in one of the dikes of the contraction improvement at Woolfolk Bar occurred in October 1895. It was repaired promptly and most judiciously by the assistant engineer in local charge, Mr. Thomas Robinson.

Work on the new hull of the snag boat *Chattahoochee* was well started during the last three months of the year.

CONDITION OF THE IMPROVEMENT JUNE 30, 1896.

The channel was about the same as at the close of 1895, except at Woolfolk Bar, where the situation was better.

OPERATIONS DURING THE YEAR ENDING JUNE 30, 1897.

a. Channel work.—The snag boat *Flint* started out on August 17, 1896. Between this date and the end of September it worked between Columbus, Ga., and Eufaula, Ala., a distance of 85 miles. The river was exceedingly low. This caused much loss of time in crossing the bars; the boat could pass from pool to pool only by vigorous use of the capstan and warping ropes. A small rise occurred in the river near the end of September. Advantage was taken of it to run the boat to Chattahoochee, Fla., whence the latter could work back upstream. The channel was cleared of all accessible snags, logs, and bowlders as far up as Eufaula, Ala., 138 miles.

The old channel at Prestons Bar, 3 miles below Eufaula, was too shallow for navigation, so the crew of the snag boat spent three weeks in clearing a passable channel through rock bowlders on the Alabama side of the river. The boat was not fitted for rock work; had the low water not favored wading to remove the fragments of rocks after blasting, the cost of the work would have been excessive.

The cost, including the time of the men employed, their subsistence, and the explosives used, amounts to $2.50 per cubic yard of bowlder measured in place. If to this be added the cost of such assistance as the snag boat, unprepared as it is for this class of work, could give, the price per cubic yard amounts to $5. The first figure is adopted solely as a basis of comparison with other work. The excessive cost on this river is but another argument in favor of a dredging plant which will reduce, not increase, the cost.

A bowlder of 3 cubic yards was blasted and removed from the channel at Rock Island, 129 miles below Eufaula.

Another rise, which came on November 1, 1896, stopped work on the Chattahoochee, so the snag boat was transferred for three months to the Apalachicola River, whence it returned in February, 1897, working its way up to Burdocks Landing, where it was laid up for the winter.

Work was resumed in June; the channel was cleared from Burdocks Landing to Columbus, Ga.

The snag boat passed three times over 223 miles of the river during the time outlined. It removed between Columbus and Eufaula 394 overhanging trees, 144 bushes, and 128 stumps from the banks; 301 logs and snags from the channel; and between Eufaula and Chattahoochee 177 overhanging trees, 18 stumps, 563 logs and snags, and 102 cubic yards of rock.

b. Rebuilding snag boat Chattahoochee.—Work was in progress on the new hull at the beginning of the year. The lumber ordered for the boat was delivered very slowly, through unavoidable circumstances on

the part of the sawmill men and through the extreme low water of the summer of 1896.

The result was that only a small force of men could be employed on the woodwork. The small force lengthened the time of doing the work and increased the cost of superintendence and incidentals. After the hull was launched, the use of a large force was not practical, as transferring of the cabin, setting up the machinery, etc., were a succession of jobs each of which had to be finished before the next could be begun. The boat was finished in June, and started at once to clear the river of snags and other drift which had been brought in by the winter freshets.

A watchman was employed at Burdocks Landing, Alabama, to take care of the property. Repairs were made to the storage sheds, around which was built a board and wire fence. Various repairs were made for the preservation of the old boats, tools, and other appliances laid up at this place, and sundry office work was done on plans, etc., preparatory for future work.

The cost of the work thus outlined was:

For channel work:	
Engineering and superintendence	$791.67
Labor	2,963.49
Subsistence	395.78
Fuel	249.50
Tools worn out and engineer's supplies	183.80
Dynamite, fuses, and wire	85.00
Traveling expenses	75.72
Stationery and miscellaneous	168.28
Total	4,913.24
Rebuilding snag boat *Chattahoochee*:	
Lumber	2,043.58
Iron, paint, oakum, etc	1,137.34
Superintendence and labor	6,156.90
Subsistence	642.18
Total	9,980.00
At Burdocks Landing, Alabama:	
Watchman, twelve months	300.00
Engineering and general office work	158.33
Labor, various repairs	414.50
Subsistence	104.60
Lumber, wire, nails, paint, etc	112.47
Total	1,089.90

CONDITION OF THE IMPROVEMENT JUNE 30, 1897.

The river is now in pretty good condition. There are left still some bars and isolated obstructions which require removal. These are to be found at St. Francis Bend, Rock Island, King Rock, and at other points where smaller amounts of work are required. A great deal is also needed in the way of repairs to the works at Hospital, Upatoie, and Shell Creek.

The rebuilding of the hull of the *Chattahoochee* is completed and the vessel is at work.

REMARKS.

Experience shows that the bars of this river are composed, in most cases, of too coarse or too tenacious materials to be controlled readily and economically by dams built of pile and brush; moreover, the water is already as shallow as safe navigation will admit below most of the bars. If by reason of heavy scour gravel is forced out of the channel

made over the bar, it lodges a little farther down and forms the nucleus of another bar, and so on. For these reasons a small dredging machine is needed to supplement the scouring action of the current, and the use of such a machine would dispense with entirely, in many cases, brush dams, and render a piece of work permanent which, with brush and ballast, can at best be only temporary.

The hulls of the pile-driver barge and of one of the flatboats are rotten. They are not worth repairing. They should be rebuilt.

RECOMMENDATIONS AND ESTIMATES.

The commerce of the Chattahoochee River warrants a good channel. Four boats run weekly between Columbus, Ga., and Apalachicola, Fla., going up the Flint River to Bainbridge regularly, and occasionally as far as Chevertown, Ga., on the way.

It is recommended that all the old works of improvement, etc., be put in repair, and that the necessary improvements be pushed as rapidly as possible.

In order to accomplish this the plant must be put in order by rebuilding the hulls of the pile driver and flatboat mentioned, and the acquisition of a small dredging machine. It would be economy to build a dredge for the joint use of the Flint and Chattahoochee rivers. The cost of such a dredge and two dump scows would be about $15,000.

The Chattahoochee, the Flint, and the Apalachicola rivers are really one system. The same boats do the trade of all, and the same plant is used in the improvement of each.

The only works which are done economically are snagging and construction of contraction works. The removal of obstructions of rock or indurated clay is, for lack of a proper plant, expensive beyond reason. The methods in use up to the present time, of blasting rock and picking up the fragments by the hands of men wading in water sometimes 4 feet and more in depth, is about the most extravagant way of doing this work that can be devised. Yet this is what has to be done frequently on both the Chattahoochee and the Flint for the reason that the appropriations have never been sufficient to provide the plant wherewith to work properly and economically.

The estimated cost of what is contemplated for the Chattahoochee River is as follows:

Dredge and scows (half cost)	$7,500
Removal of annual accumulation of snags, logs, etc	5,000
Rebuilding hulls of barge and pile driver	5,000
Repairs to works at hospital, Upatoie, Shell Creek	25,000
Excavating and controlling the channel in St. Francis Bend	30,000
Excavation of rock, etc., at Rock Island, King Rock, etc	21,000
Total	93,500

This amount can be expended judiciously and advantageously during the fiscal year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended	$29,447.26
June 30, 1897, amount expended during fiscal year	16.911.35
July 1, 1897, balance unexpended	12,535.91
July 1, 1897, outstanding liabilities	880.80
July 1, 1897, balance available	11,655.11
Amount that can be profitably expended in fiscal year ending June 30,1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	93,500.00

APPROPRIATIONS.

February 24, 1835	$2,000
Chattahoochee and Flint rivers:	
June 23, 1874	25,000
March 3, 1875	25,000
August 14, 1876	20,000
Total	*70,000
June 18, 1878	18,000
March 3, 1879	15,000
June 4, 1880	20,000
March 3, 1881	$20,000
August 2, 1882	25,000
July 5, 1884	35,000
August 5, 1886	20,000
August 11, 1888	20,000
September 19, 1890	20,000
July 13, 1892	†25,000
August 18, 1894	†30,000
June 3, 1896	†25,000
Total	273,000

COMMERCIAL STATISTICS.

The commercial statistics for the Chattahoochee River are so combined with those of the Flint River that a separation is impossible, and reference is made to that river for figures.

IMPROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAMA, BETWEEN WEST POINT AND FRANKLIN.

DESCRIPTION.

This section of the Chattahoochee River is 38 miles long. It is divided into a series of pools, varying from half a mile to 5 or 6 miles in length, by rock shoals and rapids, some of which have a fall as great as 8 feet in a mile. The width of the pools is from 300 to 500 feet, and their depth not less than 4 feet. The width of the stream at the shoals is from 800 to 1,000 feet, and the depth of the water is only a few inches.

PROJECT OF IMPROVEMENT.

The river and harbor act of September 19, 1890, provided for a preliminary examination of this section of the Chattahoochee. As a result of this examination, made in November, 1890, it was recommended that a survey be made for the purpose of founding a project of improvement and estimate of cost. The division engineer and the Chief of Engineers did not agree to this, so no survey was ever made.

The river and harbor act of July 13, 1892, allotted $5,000 from the general appropriation from the Chattahoochee River to be spent on this section.

In response to a call for a project for the expenditure of this sum, the following was submitted on July 26, 1892:

To remove the lesser rock shoals, sand and gravel bars by excavation and works of contraction; to remove overhanging trees from the banks, and snags, logs, and other obstructions from the channel, and to overcome the more serious obstructions by the construction of locks and dams to give a minimum depth of 3 feet at low water in the channel between West Point and Franklin, a distance of 38 miles.

Recommendation was made "that a party be organized for working the shoals between West Point and Bentley Mill, and continue working

*Of the joint appropriations $52,000 was expended on the Chattahoochee River.

†Of each of these appropriations $5,000 was to be expended between West Point and Franklin.

until the shoals are put in as good condition as practicable or until the funds are exhausted."

These recommendations were approved August 5, 1892.

CONDITION OF IMPROVEMENT JUNE 30, 1896.

A low-water channel 50 feet wide and 3 feet deep had been obtained through Roberts, Flat Rock, and Haynes Island shoals.

WORK DONE DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

No work was done during the year.

RECOMMENDATIONS.

The following recommendations made last year are renewed:

As much has been done on this section of the Chattahoochee as can be accomplished without undertaking an extended system of slack-water navigation. So far as can be learned there is no commerce on this part of the river; hence the cost of such expensive work would not be justified. It is recommended, therefore, that further work on this part of the river be abandoned.

As the last allotment made is insufficient to do any work on an extended scale, it is further recommended that nothing more be done for the present.

As this part of the Chattahoochee is not worth improving, no estimate for funds is made.

Money statement.

July 1, 1896, balance unexpended	$5,419.16
June 30, 1897, amount expended during fiscal year	50.00
July 1, 1897, balance unexpended	5,369.16

APPROPRIATIONS.

An allotment of $5,000 was made from the river and harbor act of July 13, 1892, a second of the same amount from the act of August 18, 1894, and a third of the same amount from the act of June 3, 1896; in all, $15,000 has been given to this part of the river.

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IMPROVEMENT OF CHOCTAWHATCHEE RIVER, FLORIDA AND ALABAMA.

DESCRIPTION.

The part of the river considered for improvement is that from the mouth to Newton, Ala., an estimated length of 162 miles. It may be divided into four sections: (1) From the mouth to Caryville, where the Pensacola and Atlantic Railroad crosses the river, 100 miles; (2) from Caryville to Geneva, 25 miles; (3) from Geneva to Hollis Bridge, 30 miles; (4) from Hollis Bridge to Newton, 7 miles.

The section below Caryville runs through a sparsely settled country, where the business is almost exclusively the cutting and rafting of timber.

The second section is the most used, nearly all of the commerce of the stream being here.

The third section is used as far as Pate Landing (25 miles above Geneva) when freight is offered at favorable stages of water.

The fourth section can not be used during low stages of the river.

The second and third sections were of very difficult navigation, as the channel was greatly obstructed by snags and logs; during times of low water sand bars offered an additional hindrance to the commerce of the stream. A series of nine shoals, formed by strata of compact blue clay, makes low-water navigation impossible between Hollis Bridge and Newton. When the project for the improvement of the Choctawhatchee River was adopted the town of Newton was dependent on the river for communication with the outside world. The Alabama Midland Railway has been completed since then from Montgomery, Ala., to Bainbridge, Ga.; this road passes through Newton; consequently the urgent necessity for improving the fourth section of the river exists no longer.

THE ORIGINAL CONDITION OF THIS CHANNEL.

Before work was commenced on this river the channel way was much obstructed by large and dangerous snags, by sunken logs, by overhanging trees, and by shoal bars, which consist of gravel and coarse sand.

This much-obstructed channel way was not at all available for the amount of commerce which passes between Caryville, Fla., a station on the Pensacola and Atlantic Railroad, and the town of Geneva, Ala., which is entirely dependent on the river for the receiving and shipping of supplies and products.

PROJECT.

The project for the improvement of the Choctawhatchee River proposes to obtain a low-water navigable channel from the mouth of the river to Newton, Ala., by the removal of logs and snags from the channel and overhanging trees from the banks, by cutting through the rock shoals, and deepening sand bars through the medium of contraction works and protection for the shores.

This project has since been amended to require a draw, approved by the Secretary of War, to be placed in Hollis Bridge before any money may be spent above this bridge.

The estimated cost of the project of 1872 was $34,332.

This estimate, revised in 1880, increased the cost to $112,832.

OPERATIONS TO JUNE 30, 1896.

A condensed account of the work done on this river from 1874 to June 30, 1895, may be found in the Report of the Chief of Engineers for 1896, part 3, pages 1366–1370.

1896.—No works of contraction were carried on. The snag boat made two trips over the river from Caryville, Fla., to Geneva, Ala. The most dangerous obstructions were removed on the first trip. The second trip saw the removal of practically all snags and logs from the channel.

The following obstructions were cleared out: Thirty-nine overhanging trees felled and cut up, 28 trees felled and pulled back, 61 stumps leveled on bank, 241 logs removed from drift piles, 306 stumps removed from drift piles, 741 snags and 965 logs taken from the river.

CONDITION OF IMPROVEMENT JUNE 30, 1896.

On June 30, 1896, the work accomplished under the approved project had secured a good navigable channel of 3½ feet at low water from Caryville, Fla., to Geneva, Ala., and varying in width from 60 to 120 feet, the narrow portions being confined to the bars which have been deepened by contraction works.

As operations were suspended during the season of 1894 and the first half of 1895, freshets during this period had carried into the river many obstructions, such as snags, which remained lodged in the channel, thus somewhat endangering navigation, especially for boats making night trips. The contraction works, which have been somewhat injured from time to time by drift and log jams, had previously secured a navigable depth over the bars where they were placed, and no shoaling has occurred.

It may be stated that the depth secured and generally maintained under the project up to the close of the fiscal year ending June 30, 1896, served very well the commercial requirements of the river.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

At the beginning of the fiscal year the plant was tied up at Caryville, Fla., in charge of a watchman. Active operations—removal of obstructions from the channel—were commenced on August 17 and continued until January 9, when the plant was taken to Caryville and placed under a watchman's care. During this time the snag boat made two trips over the river between Caryville and Geneva, removing all obstructions, such as logs and snags, which had come into and lodged in the channel during previous freshets.

Work was suspended on January 9, 1897.

WORK ACCOMPLISHED.

The following obstructions were removed:

Logs from drift piles	250
Logs removed from river	1,027
Stumps removed from channel	206
Stumps leveled on bank	106
Snags removed from channel	652
Overhanging trees felled and cut up	97
Overhanging trees pulled back	285
Overhanging trees trimmed	1
Rock removed from channel, cubic yards	10

At a total cost of $2,749.52.

CONDITION OF IMPROVEMENT JUNE 30, 1897.

The condition of the river is now much as it was a year ago. Boats run regularly at low water between Caryville and Geneva and even at night.

Some of the contraction and training works are in need of repairs and extension. The materials of which they are made are not very durable, as a rule; consequently much has to be done in the way of renewal and rebuilding. These works have done such excellent service in the past and have accomplished so much at exceedingly small cost that it is most economical and advantageous to keep them in good condition.

RECOMMENDATIONS AND ESTIMATES.

Mr. Turtle, assistant engineer in local charge of this river, says:

It is respectfully recommended that the snag boat be kept at work each season removing such obstructions as are brought into the channel during the high stages of the water, and that the pile driver be employed for about two low-water seasons continuing construction works at a few of the shoalest bars and preventing caving banks by driving longitudinal rows of piles.

The contraction works and bank protection employed have secured very satisfactory results and their continuance is recommended.

The necessary work of maintenance is growing less each year, and in the future the snag boat can assist greatly in placing contraction works.

To obtain economical and permanent results this work should be prosecuted for a few seasons without delay, after which the work of maintenance alone would be required.

Contraction works should be put in at several bars, and it should be done before the present plant now on hand for that purpose becomes unserviceable. A pile-driving barge and quarter boat were built for this class of work in 1892, and since then the funds appropriated have admitted of but one season's work with them.

If the sum appropriated for this improvement by the next Congress would be such as would justify work of contraction to be pushed for two seasons, this portion of the plant might be disposed of or its decay would not be of much importance.

It is neither wise nor economical to build a pile-driving barge and quarter boat and use them but one year in five because there is no money with which to put them to work; in other words, for one year's work they have had four of deterioration.

The sum of $20,000 can be expended economically and advantageously during the year ending June 30, 1899, to be used as follows:

Snagging, etc	$4,000
Repairs to present works	4,000
New contraction works	12,000
Total	20,000

Money statement.

July 1, 1896, balance unexpended	$5,164.48
June 30, 1897, amount expended during fiscal year	3,526.09
July 1, 1897, balance unexpended	1,638.39
July 1, 1897, outstanding liabilities	89.00
July 1, 1897, balance available	1,549.39
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	20,000.00

APPROPRIATIONS.

March 3, 1833	$5,000.00	August 11, 1888	$10,000.00
June 15, 1844, for Choctawhatchee and Holmes rivers.	10,000.00	September 19, 1890	12,500.00
June 25, 1874	5,000.00	July 13, 1892	12,500.00
March 3, 1875	5,000.00	August 18, 1894	6,000.00
August 4, 1876	5,000.00	June 3, 1896	5,000.00
March 3, 1879	5,000.00	Total	146,000.00
June 14, 1880	7,000.00	Carried to the surplus fund, 1852	2,123.38
March 3, 1881	10,000.00		
August 2, 1882	18,000.00	Balance	143,876.62
July 5, 1884	15,000.00		
August 5, 1886	15,000.00		

COMMERCIAL STATISTICS.

Capts. T. M. Day and R. S. Hill and the Geneva Transportation Company, all of Geneva, Ala., report the following commercial statistics for the fiscal year ending June 30, 1897:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips between Geneva and Caryville, Fla.
		Light.	Loaded.	
		Inches.	*Inches.*	
Annett	102.5	18	36	120
Mary Alice	39.37	18	30	115
Joe Davis	95.44	18	33	82
R. S. Hill	52	20	48	113

Freight carried.

Articles.	Quantity.	Tons.
Cotton ..... bales	11,762	2,947
Fertilizers ..... sacks	48,412	4,841
Hides ..... packages	79	21
Lumber ..... feet B. M	150,000	250
Provisions ..... packages	31,947	10,777
Grain ..... sacks	42,977	4,811
Miscellaneous freight ..... packages	39,518	5,520
Staves	10,000	75
Rosin ..... barrels	18,000	4,800
Wool ..... bales	124	19
Total	.....	34,070

The estimated value of above freight in round numbers is	$2,000,000
The estimated value of logs and timber rafted is	900,000
Total value of all	2,900,000

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IMPROVEMENT OF PENSACOLA HARBOR, FLORIDA.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENTS WERE BEGUN.

Pensacola Harbor, the finest harbor on the Gulf of Mexico, is at the extreme western end of the State of Florida.

Pensacola Bay is a large sheet of water of irregular shape, separated from the Gulf of Mexico by Santa Rosa Island, which is part of the littoral cordon of the Gulf.

Between Santa Rosa Island and the mainland lies Santa Rosa Sound, a strip of water 37.5 miles long and varying in width from an eighth of a mile to 2 miles.

A long tongue of land making in from the eastward separates Santa Rosa Sound from the greater part of Pensacola Bay. North of this tongue of land Pensacola Bay divides into two arms, which have their axes nearly north and south. The west arm is called Escambia Bay, into the northern end of which empties Escambia River. The eastern arm is in two parts—East Bay, with its extension northward, called Blackwater Bay.

Pensacola Bay is 24 miles long from the extreme eastern end of East Bay to the entrance from the Gulf. Its total water surface, including

Escambia, East, and Blackwater bays and the western part of Santa Rosa Sound, is about 150 square miles.

The entrance to Pensacola Bay is at the extreme western end of Santa Rosa Island. The bay lies wholly to the east of the entrance. The passage through the gorge of the entrance is very deep, reaching at one point as much as 52.5 feet. Inside of the entrance and for a distance of 9 or 10 miles vessels drawing 30 feet of water can move easily and safely.

It is not easy to gain entrance to the bay. Access thereto is denied by a bar on which there is rarely, even at the deepest point, more than 21 feet of water at mean low tide. This bar is roughly elliptical in shape. Starting from the shore to the west of the entrance, at a point 1,900 feet beyond the front beacon of the McRee range, the axis of the bar swings around gradually to a point on the shore line rather more than 4,500 feet to the east of Fort Pickens. This curve may be divided into two unequal parts, one about two-thirds of its development from the west, the other about one-third from the east, the point of division being nearly midway between the 18-foot curves and in a depth of 21 feet, more or less, according to circumstances. The western two-thirds of the bar is called the Caucus Shoal; the eastern third is called the East Bank. Inside of this bar a shoal makes out from the western end of Santa Rosa Island. It is called the Middle Ground. It has its axis nearly north and south.

The passageway between the Caucus Shoal and the East Bank is called the outer bar; that between the Caucus Shoal and the Middle Ground is called the inner bar. A cut has been dredged several times to a depth of 24 to 26 feet across the inner bar. As its axis made always a wide angle with the direction of the currents, especially those of the ebb, the cut has closed up again soon after each opening.

The passageways across the outer and inner bars have been narrowed gradually. The nearest points of the various curves of depth have had the following distances between them at the dates mentioned:

Inner bar.

Distance between—	1822.	1856.	1890.	1895.	1896.
	Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*
12-foot curves	2,050	1,525	2,050	2,000	.....
18-foot curves	1,400	1,350	225	367	213
21-foot curves	1,125	1,050	*667	*133	a53

a These two measurements are taken along the sailing line. All the others are taken across it.

Outer bar.

Distance between—	1822.	1856.	1890.	1896.
	Yards.	*Yards.*	*Yards.*	*Yards.*
18-foot curves	1,925	1,100	850	775
21-foot curves	950	500	350	355
24-foot curves	875	1,075	1,000	1,017

In this table the distance between the 24-foot curves is measured in the direction of the sailing lines. The distances between the other curves are taken across the sailing lines to the nearest points of the curves.

Up to 1856, at least, vessels drawing not more than 18 to 20 feet of water could beat into the bay.

PROJECTS.

Project of 1877.—This project included only the removal of four wrecks, these being a ship of 1,200 tons, wrecked on the Middle Ground in 1869; a bark of 900 tons, wrecked alongside of the preceding in March, 1872; a steamer of 375 tons, wrecked about half a mile south of the light-house in 1864; a pilot boat of 34 tons, sunk in 4½ fathoms of water 1 mile north-northeast of the outer bar buoy on May 31, 1875.

Project of 1878.—This project, as definitely presented, was: First, to remove the above wrecks by contract; second, to make an examination or survey to determine the most advantageous expenditure of any remaining balance of the appropriation or for further recommendations for improvement.

Project of 1881.—This project was presented by the Board of Engineers of February 12, 1881. It provided for dredging a channel 300 feet wide and 24 feet deep at mean low water across the inner bar and for protecting the shore line near Fort McRee from further abrasion by the construction of jetties and works of shore protection, with the view of preventing further injurious changes in the tidal currents and also of retaining the position for defensive purposes. The water on the inner bar was then only 19.5 feet deep. This project will be found in full in the Report of the Chief of Engineers for 1881, page 117.

Project for 1891.—This project, prepared by a special Board of Engineers, was presented July 16, 1891. It provides, briefly, for the building of two jetties, one from the west end of Santa Rosa Island, the other from the west side of the entrance of the bay, the jetties to have shore arms normal to the water line of the shore and to be of such length as to bring their outer ends 4,500 feet apart when finished. The jetties from the ends of the shore arms are to follow as nearly as possible the line of the ebb currents, and to converge toward each other so that the distance between them at their outer ends should be 3,500 feet. Dredging to hasten the opening of the new channel is also a part of the scheme. The full report of this Board may be found in the Report of the Chief of Engineers for 1891, page 1723.

First amendment to the project of 1891.—A special Board of Engineers appointed "to reconsider the project for the improvement of the harbor of Pensacola, Fla.," presented its report on August 20, 1895. This Board made no change in the project of 1891. It recommended "that the engineer officer in charge be directed to take the necessary steps to secure immediately the use of one of the powerful hydraulic dredges now owned by the United States, and to open a channel 26 feet deep at mean low water and as wide as practicable on the line of the deepest water across Caucus Shoals, approximately on the line of the axis of the jetty channel recommended by the Board of 1891, and that he be authorized to use for this purpose as much of the funds now available as may be necessary." This report may be found in the Report of the Chief of Engineers for 1895, page 1657.

Second amendment to project of 1891:—This amendment was submitted by the same Board that recommended the first amendment, one officer having been added to the Board. It is as follows:

1. The Board recommends that all funds now available be expended in continuing the work of dredging across Caucus Shoals.
2. If funds sufficient for the construction of a suitable dredge and for its operation for a period of at least two years be made available by the next river and harbor act, the Board recommends that such a dredge be built and a channel opened across Caucus Shoal, at least 300 feet wide, having a least mean low-water depth of 30 feet, with such side slopes as the material will assume.

Until a channel be opened by dredging across Caucus Shoal, as herein proposed, the Board recommends that the construction of jetties for its economical maintenance be not further considered.

The existing conditions at the western end of Santa Rosa Island and near Fort McRee should, however, be maintained by the construction. if necessary, of suitable shore protection, which may be utilized as bases for jetties should their construction become imperative.

OPERATIONS TO JUNE 30, 1896.

A brief résumé of the operations at Pensacola up to June 30, 1895, can be found in the Report of the Chief of Engineers for 1896, part 3, pages 1375–1377.

1896.—The United States dredge *Gedney* was sent from New York to Pensacola, where it began work on the channel across Caucus Shoal on October 23, 1895. It continued work as weather and repairs allowed until the close of the year. A full account of its work and the cost thereof is given in the Report of the Chief of Engineers for 1896, part 3, pages 1377–1389.

CONDITION OF THE IMPROVEMENT JUNE 30, 1896.

Jetties.—The jetties on the west side of the entrance to the bay were in good order.

Channels.—The depth of water on the inner bar did not exceed 21 feet. The least depth in the Caucus Channel was 23 feet, but this was on a point a couple of hundred yards north of the channel proper, which projected out beyond the general line of the 24-foot curve. The least depth between the 24-foot curve inside the shoal and the same curve outside was 23.7 feet for a length of 55 feet. The average depth 75′ east of the axis of the channel was 19 feet; it was the same on a line 75′ west.

OPERATIONS DURING THE YEAR ENDING JUNE 30, 1897.

The *Gedney* was still at work at the beginning of the year dredging in the Caucus Channel. Operations were suspended by reason of heavy weather on July 2, 1896, and were not resumed until July 13. The rudderstock was broken on July 17. The vessel had to go to New Orleans for repairs; it did not return until August 2. Meanwhile, Colonel Gillespie requested that it be returned to New York, so no further dredging was done.

Several violent storms which occurred during the fall, winter, and spring of 1896–97, and especially the one of January, 1897, caused a shoaling of the channel through the Caucus Shoal. This shoaling, from September, 1896, to April, 1897, amounted to 2.6 feet, on an average, along the axis of the channel, to 1.5 feet along the line 50 feet east, and to 1.3 feet along the line 50 feet west of the axis.

An agreement was made with the Rittenhouse Moore Dredging Company, of Mobile, Ala., to remove 200,000 cubic yards at 10 cents a yard. This amount was increased subsequently to 300,000 cubic yards. Work was begun on April 20, 1897; it was still going on at the close of the year.

After the passage of the river and harbor act of 1896, the engineer officer in charge of this work was directed to prepare general specifications for a dredge for this harbor. These were practically complete by the end of October. Consultation with shipbuilders and with parties who had had experience in this class of work caused the engineer officer in charge to ask authority from the Chief of Engineers to prepare detailed specifications for the hull of the vessel. This authority was

granted on November 3, 1896. Since that time the preparation of the plans and specifications have gone on as rapidly as possible. They were well under way at the close of the year.

SURVEY OF THE ENTRANCE TO PENSACOLA HARBOR, FLORIDA.

This survey was begun on July 20, 1896. It included the whole of the shoals at the entrance, parts of which had been omitted in former surveys. The field work was completed on October 3, 1896. The area covered was 13.9 square miles; the number of soundings taken was 13,027; the cost was $3,555.44; hence the cost per square mile was $255.78.

MISCELLANEOUS WORK.

The center ranges of the Caucus Channel were blown down by the gale of July 7, 1896, when the wind reached a velocity of 100 miles an hour for a few minutes. These were rebuilt. Sixteen smaller ranges were put up to mark lines parallel to the axis of the cut and 50 feet apart on either side up to a distance of 200 feet. These ranges are to facilitate soundings through the cut to determine from time to time what changes are going on.

The center ranges have been kept lighted at night under authority of the Chief of Engineers since August 20, 1896.

The breaches in the shore line, caused by the storm of July 7, 1896, have closed.

CONDITION OF THE IMPROVEMENT JUNE 30, 1897.

Jetties.—The jetties near Fort McRee are still in good condition; they show no signs of settlement or deterioration.

Channels.—It is not known to what extent the old channel has changed since last fall, as no survey has been made yet to determine it. No special attention has been paid to it, as it has become of little importance since the Caucus Cut was opened.

The channel through the Caucus Shoal has held its own remarkably well considering how narrow it is. The great gale of January, 1897, caused a most violent sea. One pilot stated that he saw sand brought up from the bottom of the gulf in more than 6 fathoms of water. A great deal of the south side of Santa Rosa Island, just in front of the new 10-inch gun battery, was cut away.

The movement of material must have been excessive. Surveys have not yet been made of sufficient extent to state exactly how much material was thrown into the channel, but from such data as is available I should say that it is more than 75,000 cubic yards at the outside.

A set of soundings was taken through the channel on April 27, 1897. These soundings show an average loss of depth of 2.6 feet along the center line, of 1.5 feet along the line 50 feet east of the center, and of 1.3 along the line 50 feet west of the center, or an average of 1.8 feet over the whole. The channel is 6,000 feet long. A channel width of 150 feet has been assumed for computation. With these dimensions the fill is 60,000 cubic yards. But this is evidently too much, because the sides of the channel slope upward from the center line; hence the fill farther from the center line is less.

The experience of the past year shows that the annual deposit to be anticipated here will be well within the limit of easy and economical handling.

If the channel had had its full depth and width, it is believed that the shoaling would not have been appreciable.

RECOMMENDATIONS AND ESTIMATES.

While it is unlikely, judging by the experience of the past year, that any serious breach is likely to occur in the shore line, it will be well to have on hand a sum sufficient to meet any such emergency. It is recommended that $25,000 be appropriated for such a contingent expense.

The cost of dredging is estimated at $50,000 a year. This amount can be expended profitably and advantageously during the year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended	$254,912.43
June 30, 1897, amount expended during fiscal year	30,828.49
July 1, 1897, balance unexpended	224,083.94
July 1, 1897, amount covered by uncompleted contracts	10,872.06
July 1, 1897, balance available	213,211.88
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	50,000.00

APPROPRIATIONS.

June 18, 1878	$20,000	August 11, 1888	$35,000
March 3, 1879	10,000	September 19, 1890	25,000
June 14, 1880	40,000	July 13, 1892	75,000
March 3, 1881	20,000	August 18, 1894	100,000
August 2, 1882	50,000	June 3, 1896	200,000
July 5, 1884	55,000		
August 5, 1886	20,000	Total	650,000

COMMERCIAL STATISTICS.

The following information has been furnished by Mr. S. A. Moreno, deputy collector of customs and statistical clerk of the port of Pensacola, Fla.:

Exports to foreign ports	$8,069,294
Exports to coastwise ports	281,071
Total value of exports	8,350,365
Imports from foreign ports	530,451
Duties on imports and miscellaneous collections	4,392

	Number.	Tons.
Vessels entered from foreign ports	406	429,257
Vessels entered from coastwise ports	102	91,958
Total	508	521,215
Vessels cleared for foreign ports	424	457,377
Vessels cleared for domestic ports	86	61,843
Total	510	519,220
Number of vessels employed in traffic of port:		
Steam	33	4,343
Sail	131	5,631
Total	164	9,974

Coastwise exports consisted of:

Lumber, 9,771,000 feet B. M., at $10 per M	$97,710
Coal, 88,296 tons, at $2 per ton	176,592
Pig iron, 25 tons, at $10 per ton	250
Miscellaneous shipments	6,519
Total	281,071

P 8.

IMPROVEMENT OF ESCAMBIA AND CONECUH RIVERS, FLORIDA AND ALABAMA.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENT.

These two names apply to the same river, which is known by the name of Escambia from the boundary line between the States of Alabama and Florida to the mouth of the river, in Escambia Bay, an arm of Pensacola Bay, and the Conecuh north of the Florida and Alabama State line.

An examination of the part of the river lying south of the Alabama State line, a length of 100 miles, was made between the 19th and 28th of November, 1878. In this distance the width of the river is rarely less than 150 feet and often increases to 300 feet. The country through which it flows is, with but little exception, low, swampy, and subject to overflow for several miles on either side. At the mouth of the river, where it empties into Escambia Bay, there exists a bar on which the depth of water is not stated. The channel of the river was tortuous and was much obstructed by snags, logs, etc. There were also a few points to be cut off by means of dredging.

PROJECT.

The improvements suggested were to dredge a channel through the bar 150 feet wide and 5½ feet deep at mean low tide, to remove other obstructions, and construct a few dikes, wing dams, and shore protection, so as to give a good navigable channel of a minimum depth of 5 feet throughout its entire length at ordinary low water. The original estimate of the cost of the improvement was $87,430.

OPERATIONS TO JUNE 30, 1896.

The operations on this stream from 1880 to June 30, 1895, are given briefly in the Report of the Chief of Engineers for 1896, part 3, pp. 1393–1395.

1896.—Work was carried on from the beginning of the year to December 20, 1895. During this time 24 overhanging trees were felled and cut up and 4 trimmed; 215 logs cut up and stumps leveled on bank; 368 logs removed from drift piles; 110 stumps, 1,332 snags, and 43 logs removed from the river. The total cost of these operations was $2,757.40. The work extended over 56 miles of the river, in the part most dangerous to rafting and most difficult to maintain.

CONDITION OF IMPROVEMENT JUNE 30, 1896.

The river was in good condition for rafting, but the bar at the mouth was impassable for tugs.

OPERATIONS DURING THE YEAR ENDING JUNE 30, 1897.

The beginning of the fiscal year was spent in making needed repairs to boats, decks, and derricks. These repairs were completed on August 3 and active operations were begun on the 4th.

The snag boat first worked upstream until early in November, when, owing to extreme low water and to the considerable distance between obstructions, the boat dropped back to the more obstructed stretches of the river below Brewton, Ala.

Work was continued downstream until December 5, when it was suspended on account of high water. The snag boat was taken to "Old River," 3 miles above Brewton; the plant and property were put away, and the whole was placed in charge of a watchman on December 20.

Owing to the condition of the funds, not sufficient to work two seasons, only the most dangerous obstructions were removed.

The length of river worked over was 25¼ miles.

WORK PERFORMED.

The following obstructions were removed:

Overhanging trees felled and cut up	32
Overhanging trees pulled back	7
Logs cut up or stumps leveled on bank	189
Stumps removed	150
Logs removed from drift piles	84
Snags removed from river	1,265
Logs removed from river	142
Cubic yards marl or clay excavated	20

At a total cost of $2,589.85.

RECOMMENDATIONS AND ESTIMATES.

The most necessary work on this stream is the dredging of a channel through the bar at its mouth. It is impossible for tugs to go inside the bar to bring out the rafts which are floated down the river. It is necessary, therefore, to float out the rafts and tie them up in open bay. There they break loose sometimes and much valuable timber is lost.

It will cost $12,000 to dig a channel 100 feet wide and 8 feet deep through the bar.

Snagging operations, when carried on properly, require $6,000 a year.

The commerce of this river amounts to more than $2,000,000 a year. The amounts required to do the necessary work on this river are in all $18,000, or only nine-tenths of 1 per cent of the annual commerce.

Money statement.

July 1, 1896, balance unexpended		$4,475.95
June 30, 1897, amount expended during fiscal year		3,642.62
July 1, 1897, balance unexpended		833.33
July 1, 1897, outstanding liabilities		64.50
July 1, 1897, balance available		768.83
Amount that can be profitably expended in fiscal year ending June 30, 1899. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		18,000.00

APPROPRIATIONS.

For Escambia River:	
March 2, 1833	$5,000
July 2, 1836	5,500
June 14, 1880	8,000
March 3, 1881	5,000
July 5, 1884	3,000
For Escambia and Conecuh rivers:	
August 2, 1882	12,000
July 5, 1884	12,000
August 5, 1886	12,000
August 11, 1888	10,000
For Escambia and Conecuh rivers—Continued.	
September 19, 1890	$7,500
July 13, 1892	8,000
August 18, 1894	6,000
June 3, 1896	4,000
Total	98,000
Carried to the surplus fund, 1838.	5,500
Balance	92,500

COMMERCIAL STATISTICS.

The commerce of this river is principally the transportation of logs, lumber, and timber, and is carried to Pensacola, Fla., for export. The amount of this commerce is stated to be about 60 per cent of the export trade of the port of Pensacola, Fla., for the fiscal year ending June 30, 1897.

P 9.

IMPROVEMENT OF ALABAMA RIVER, ALABAMA.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENTS WERE BEGUN.

The Alabama River is formed by the junction of the Coosa and Tallapoosa rivers, which come together at a point 14 miles above Montgomery, Ala. The general direction of the stream is southwest from the junction of its affluents to Montgomery; from Montgomery to Selma, Ala., it is nearly west; from Selma to the junction of the Alabama and Tombigbee rivers it is slightly west of south. The total length of the river is approximately 310 miles.

The normal width of the Alabama from Wetumpka to Selma is from 500 to 600 feet; from Selma to its junction with the Tombigbee it is from 700 to 800 feet.

As the river is made up of a series of pools and shoals alternating with each other, its depth varies greatly. More than 25 feet has been found in some pools and less than 2 feet on some of the shoals.

The fall of the river is unknown. No survey has ever been made. No continuous line of levels has ever been run. Its discharge has never been determined. There are no data available on which to found a systematic and comprehensive scheme of improvement.

The original condition of the river was very bad. It was so obstructed by logs, snags, and fallen trees in the channel, by overhanging trees on the banks, and by bars and shoals, on many of which the low-water depth was only 2.5 to 3.5 feet, that navigation was difficult and dangerous at all times. It was practicable only by day during the low-water season. Long detentions were frequent at shoals below Selma, and traffic was suspended between Selma and Montgomery when the water was low.

PROJECT.

The original project for the improvement of this stream (see Report of the Chief of Engineers for 1876, Part I, p. 498) looked toward obtaining a channel 4 feet deep at low water, with a minimum width of 200 feet. This result was to be obtained by removing logs and snags from the channel and overhanging trees from the banks; by cutting through rock reefs and gravel bars; by blasting and dredging; by deepening the channel across sand shoals and bars by works of contraction; by stopping the caving and the washing of the banks by shore protection. The estimated cost of carrying out this project was $229,741.

First amendment.—The above project was amended. (See Annual Report Chief of Engineers for 1891, Part III, p. 1761.) The amended project differs from the original only in the depth to be obtained. This was put at 6 feet instead of 4 feet. The estimated cost of the amended project was placed at $386,251. Snagging operations and the maintenance of the increased depth when obtained were estimated to cost $10,000 a year.

OPERATIONS TO JUNE 30, 1896.

A brief account of the operations on this stream from 1879 to June 30, 1895, is given in the Report of the Chief of Engineers for 1896, Part III, pages 1397–1399.

1896.—All visible logs and snags were removed from the channel, and all overhanging trees from the chutes from Scotts Bend, 5 miles above Montgomery, to the mouth of the river.

Work at Tate Shoals, suspended on December 15, 1894, was begun again in September, 1895, and completed during the autumn. A shore revetment was built on the left bank opposite the foot of the dike.

The dike at Carter Shoals was repaired.

A short dike was built half a mile below Dike No. 2 at Silver Creek Shoals.

An account of these works and their cost is given in the Report of the Chief of Engineers for 1896, part 3, pages 1400–1401.

A survey covering Mary Taylor, Portland, and Hurricane Bluff bars was made. The length of river examined was 14.4 miles. (For methods and cost see the Report of the Chief of Engineers for 1896, Part III, pp. 1402–1403.)

CONDITION OF IMPROVEMENT JUNE 30, 1896.

The river had never before reached so low a stage as it did during the autumn of 1895. It was 0.8 foot lower between Montgomery and Selma, and 1.25 feet lower below Selma than ever known before. This must be borne in mind in considering the condition of the work.

The result of the work done at Tate Shoals was a straight channel 300 feet wide and 7 feet deep at extreme low water, an increase in depth of 4.5 feet. Steamboats carrying full cargoes had no trouble or delay during the low-water season of 1895–96; in 1894 they had to lighter their cargoes each way across the shoals, causing a delay of twenty-four to forty-eight hours on each trip.

Steamboats carrying full cargoes ran uninterruptedly between Mobile and Hurricane Bluff (a distance of 204 miles) during the entire year, and during the remaining ten months of the year between Mobile and Montgomery.

So far as snags and overhanging timber are concerned, the river was in good, although not perfect, condition. Since the construction of auxiliary works was begun in 1892 there had been no chance to clear the river thoroughly of this sort of obstructions, as the snag boat had to be in almost constant use as a towboat.

The contraction works built since 1892 were all in good condition. The improvement of the channel obtained at each point was maintained. At some places a further increase of depth was noticed.

OPERATIONS DURING THE YEAR ENDING JUNE 30, 1897.

a. Snagging.—This class of work began on July 30, 1896, at Scotts Bend, 5 miles above Montgomery. All the dangerous logs and snags which were visible at the then existing stage of the water were taken out, and the overhanging trees in the various chutes were cut back as far down as Evans Island, 164 miles below Montgomery. The chute around the right side of the island had been the navigable channel for thirty years. It had shoaled to such an extent as to become impassable, and the river had crossed to the left chute, which was filled with the accumulation of logs and snags which had taken place during the years that this channel was unused. The left chute was cleared thoroughly of the logs and snags, and a heavy growth of overhanging trees was cut out. Eleven days' work was required to accomplish all this.

The snag boat went rapidly over the rest of the river to its mouth, 293½ miles below Montgomery. Thence the boat turned back and gave the river a thorough clearing to Bells Landing, 194½ miles below Montgomery.

The snag boat was sent to the assistance of the towboat *Mills*, which was aground on Canton Lower Bar, 143 miles below Montgomery. Progress up the river was slow on account of the extreme low water. The snag boat could come no nearer than 8 miles of the *Mills*. The crew of the snag boat was sent up in boats, with all necessary tackle, and finally the *Mills* and tow were worked over the bar.

The snag boat then resumed its legitimate work at Bell's Landing and continued it up to Stewarts Bar, 58 miles below Montgomery, where work was suspended on November 23, 1896. The boat then went to Lower Canton Bar to assist in building the dike at that point. Afterwards it cleared the shores just above Miller's Ferry of logs, stumps, and timber, and the river of snags, in order to make a berth for the boats to lie in during the winter.

The amount of work done and its cost were:

Overhanging trees felled and cut up	614
Overhanging trees felled and pulled back	265
Overhanging trees trimmed	165
Stumps cut level on bank	133
Logs cut up on bank	31
Stumps removed from river	139
Large trees and snags removed from river	924
Logs and small snags removed from river	227
Total	2,498
Wreck of flatboat removed from river	1
Length of river worked over ..... miles	295
Boat ran ..... do	1,195
Coal consumed ..... tons	29½
Wood consumed ..... cords	205½

The total expenses of the snag boat *Wm. J. Twining* were:

Engineering and superintendence and labor		$2,803.51
Subsistence		509.71
Fuel		388.35
Engine supplies and lights		48.18
Medicine		6.72
Stationery		5.00
Traveling expenses		15.65
Outfit		371.04
Total		4,148.16
Assisting *Mills* over bar	$90.36	
Dike work, Hurricane Bluff	21.11	
Dike work, Canton Lower Bar	51.04	
Outfit	371.04	
		533.55
Net cost of snagging operations		3,614.61

b. Contraction works.—Work was started at Hurricane Bluff, 132½ miles below Montgomery, two quarter boats and two pile drivers being left here for the purpose. The *Mills* went to Maiben's Landing, 209 miles below Montgomery, for piles. It grounded on Canton Lower Bar and stuck there for thirteen days. The remainder of the plant came down with the towboat *Coosada*. A delay of five days was made at Selma to get new chimneys and breeching for the towboat. The tow grounded on Mary Taylor Bar, 106 miles below Montgomery, by reason of low water, and stuck there ten days. It was released finally by blasting off the top crust of the bar with dynamite, thus obtaining an extra foot of water. The work was well under way finally on September 25.

The construction of the dike at this point is the same as that followed at Tates Shoals. (See the Report of the Chief of Engineers for 1896, Part III, p. 1400.) It starts from the right bank at an angle of about 45° with the shore line and runs out into the river 388 feet. It there bends gradually to a direction parallel to the axis of the channel, which it keeps for 543 feet. A single row of piling well wattled with cane and poles continues downstream 123 feet from the end of the preceding section. The shore arm of the dike was secured with a protection of cane mattress and riprap extending 90 feet up the bank with an average width of 40 feet. The total length of the dike is 1,144 feet.

The work on this dike was carried on under great difficulties. The driver was constantly aground during the whole time; nearly half the material used had to be lightered across from the opposite shore, the partly loaded barges being dragged over the shifting sand and gravel reef by long lines from the capstan of the *Coosada*. The depth of water across the reef was often not more than 12 inches; the position and form of the reef changed from day to day, consequently the delivery of material and driving of piles was exceedingly slow and difficult. The dike was finished by November 14.

The building of the dike caused a change of the direction of the current; the water began to cut the opposite shore, which had to be protected by a structure like that at Tates Shoals. (Report of the Chief of Engineers for 1896, p. 1401.) This protection is 1,102 feet long with an average width of 28 feet.

After finishing work at Hurricane Bluff a similar dike was built at Lower Canton Bar. Its length is:

	Feet.
Brush and rock portion	782
Wattled-pile portion	230
Shore end	49
Total	1,061

The material used in and cost of each work was as follows:

Classification.	Hurricane Bluff Shoals.						Canton Lower Bar Dike.		
	Dike.			Shore protection.					
	Number.	Cost.	Total cost.	Number.	Cost.	Total cost.	Number.	Cost.	Total cost.
Piles	165	$4.942	$815.43	165	$2.471+	$407.84	185	$2.58+	$477.34
Cane.....cords	245	1.883+	461.39	261	1.512+	394.90	344	1.522	523.57
Mattress laid.....sq. yds	705	.2262	159.48	2,512	.068+	173.18	1,977	.083+	165.94
Clearing and sloping bank	.....	.....	.....	.....	.....	21.31	.....	.....	9.94
Poles wattled	455	.1512+	68.81	870	.144+	126.09	510	.252+	128.75
Rock placed.....tons	1,802	1.446+	2,606.87	1,020	.999+	1,019.11	1,279	1.063+	1,360.07
Moving logs from piles	.....	.....	.....	.....	.....	.....	110	.134+	14.81
Transferring boats and barges	.....	.....	7.51	.....	.....	16.80	.....	.....	89.75
Cost of getting supplies	.....	.....	70.12	.....	.....	52.96	.....	.....	.....
Miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	84.01
Traveling expenses	.....	.....	.....	.....	.....	38.78	.....	.....	.....
Total	.....	.....	4,189.61	.....	.....	2,250.97	.....	.....	2,854.18

After work was finished at Lower Canton Bar it was too late to do anything further. The plant was laid up for the winter. The snag boat *Twining* and the towboat *Coosada* were sent to Mobile for thorough repairs.

The *Twining* was built at Mobile in 1881. The work was done by day labor, under the direction of Mr. W. L. Campbell, then assistant engineer on the Alabama River, at present chief clerk of the Engineer Office at Montgomery. The boat has been in constant service ever since, without having been docked once until the past winter and without receiving any extensive repairs. Those made were as follows:

A new stern and bow were put in; all decayed planks in the sides were removed; the entire hull was recalked; nearly all of the main deck was renewed; new bolsters, step, and one leg to sheer frame were put on; the cylinder timbers were repaired; a new wheel was made, and the boiler deck and hurricane roof were repaired. A new ash pan and well were put in; a new set of breeching was put up; fire bed and brickwork around boilers were renewed; new fire liners and a set of grate bars were furnished, and the exhaust and branch steam pipes were repaired. The machinery was all overhauled; new suctions and siphons were put in; piping was renewed when necessary. The roof was recovered and the entire snag boat was repainted. The boat is now in practically as good condition as when originally built.

A new working skiff was also supplied.

The cost of these repairs was:

Docking and carpenter work	$3,478.53
Sheet-iron work around boilers	355.24
Fire liners and set of grate bars	70.17
Covering roof and repainting entire boat	580.50
Material for machinery and piping	68.90
Lumber for wheel and skiff	50.00
Wages for employees	490.00
Traveling expenses	23.79
Telegram	.43
Total	5,117.56

The steamer *Coosada* was docked and recalked; some slight repairs were made. The roof was recanvassed and painted.

The cost of these repairs was:

Docking and carpenter work	$165.82
Calking	62.22
Recanvasing and painting roof	181.50
Total	409.54

SURVEY OF CERTAIN BARS ON THE ALABAMA RIVER, ALABAMA.

A survey was made of the following bars: Upper Canton, Middle Canton, Lower Canton, Youngs, and Mixons and McGuires, these last being practically one. Complete maps of the river in these localities were made; they will be of great value in determining more precisely the proper courses to be followed in carrying on the work of improvement at each place.

The methods followed are those laid down in the Report of the Chief of Engineers for 1896, Part III, pages 1402–1404, modified slightly, as suggested by the experience of the preceding year.

The total length of the survey is 9.88 miles.

Nearly three weeks' time was lost in floating down the river from Montgomery. It was impossible, on account of the low stage of the water, to send a towboat to take the quarter boat of the party down to its station, consequently the quarter boat was floated down. The low water and much head wind retarded the boat's progress greatly.

A base line was measured from △ station 4 to △ station 6, these being station 10 + 63.3 and 20 + 65 of the traverse line. The length of the line was determined by means of a steel tape 100 feet long. Each length was corrected for temperature. The length of the base is 1,002.394 feet.

Observations on Polaris at its western elongation were made early in the morning of October 15, 1896. The observations were taken from △ 23, a monument on the left bank; they were connected with △ 20, a monument on the right bank, and △ 24, milepost 144 from Montgomery. The variation of the needle was found to be 3° 35′ east. The monuments and the milepost being of concrete are permanent and can be found readily.

The discharge of the river was determined at a point 142 miles below Montgomery. The velocities were determined by means of observations on floats passing over a distance of 400 feet. The time of passing each 200 feet was noted. The discharge was found to be 5,213.13 cubic feet per second when the surface of the water is a foot above low water.

The levels of this survey were connected with those of last season.

The cost of this survey was:

Labor	$4,301.92	Incidental expenses	$10.10
Subsistence	363.61	Engineering instruments	53.40
Materials	104.93		
Property	96.52	Total	4,956.78
General repairs	26.30		

Detailed statement:

From September 16 to 24, 1895, getting party together and repairing boat, etc	$89.83
Field work from September 25 to December 7, 1896	3,056.61
Completing triangulations, testing levels, and running and testing 20 miles of levels connecting survey of 1896 with that of 1895	585.34
Cost of working up notes and making maps	1,015.00
Total cost of survey and office work of survey, 1896	4,746.78
Work on cross sections and maps of survey, 1895	210.00
Total	4,956.78

CONDITION OF THE IMPROVEMENT JUNE 30, 1897.

The river was still lower in 1896 than in 1895. The gauge at Montgomery read 1.5 feet below zero; the water in the river below Selma reached a point 2.25 feet lower than what had been considered low water

prior to 1895. It continued at this stage from the middle of September to the middle of November. Prairie Bluff, 151 miles below Montgomery, was the head of navigation during this period. Steamboats made their regular trips from Mobile to this point.

The contraction works built since 1892 are still in good condition.

The season was excellent for snagging. When it closed, the river was entirely clear of snags and logs and the banks of the chutes had been rid of stumps and overhanging timber from Stewarts Bar to the mouth, a distance of 235 miles. The river was also in good condition from Montgomery to Stewarts Bar, but during the high water of 1897, which was of exceptionally long duration, a large amount of drift was brought down and big slides took place at a number of chutes, so that when the normal low-water stage was reached steamboats found much trouble in passing the slides and snags in the narrow chutes.

REMARKS.

The present project calls for practically a navigable depth at 6 feet at low water in the open river. This depth can not be obtained, as the water is not in the river. It is very doubtful whether even 4 feet could be maintained between Montgomery and Selma.

There is no survey of this river in existence which gives any information on which to found a complete scheme of improvement. Two local surveys have been made, one during the summer and autumn of 1895, covering a length of 14.17 miles in which are found three important bars, Mary Taylor, Portland, and Hurricane Bluff; another in the autumn of 1896, covering 9.88 miles of river, and covering Upper Canton, Middle Canton, Lower Canton, Youngs, Mixons, and McGuires bars. These surveys were made for the purpose of obtaining data as to the action of the contraction works put in at the various bars mentioned, not only on the bars themselves, but also on the bed of the river in their neighborhood. There has been, up to the present time, no way of determining what this action is.

RECOMMENDATIONS AND ESTIMATES.

While much good has followed at the immediate point of application of contraction works, it is impossible to say what effect has been produced above and below them. No surveys exist whereby to make comparisons except just where the work is done, and such local surveys show only the changes in the depth at the point where the work stands. They do not show what has become of the material removed from the bar.

It is quite as important, nay, it is more important, for the engineer to know what has become of this material and what effects have been produced at other points than it is to know that the depth has been increased. If a current strong enough to scour out a sand or gravel bar be brought to bear on the bar, material must be moved until a new channel be obtained of such dimensions as will reduce the strength of the current to that which is unable to set in motion any more of the bar. But the engineer ought to know what to do with this material before he sets it in motion. He should have decided on some definite place for its deposit where, if it can not be made to assist in the work of improvement, it will at least do no harm.

A careful and accurate survey is required to acquire this knowledge. An accurate survey was made during the year 1896 of the neighborhood of Mary Taylor, Portland, and Hurricane Bluff bars. A similar survey

of Upper, Middle, and Lower Canton bars, of Mixons, McGuires, and Youngs bars, was made during the year 1897. With these surveys contraction works can be laid out much better than was the case formerly, and the results obtained can be followed better.

A small dredge and two dump scows would be a valuable addition to the working plant of the Alabama River. As it is now, when channels are cut through bars by means of contraction works, there is no control over the material which is carried down stream. Some of it lands immediately below the place whence it is taken and becomes another bar, which has to be removed in the same manner as the one removed but a short distance above. With dredging, a great deal of material could be carried away and dumped in places where it would do no harm to the channel. In addition to this, there are many cases when a cut could be made through a bar by means of the dredge in less time than it would take to assemble all the materials necessary for the contraction works and for the protection of the bank. A proper dredge for this work would cost about $12,000, and two dump scows would cost about $2,500 each.

It is believed that much good might be accomplished by placing across many of the deep pools of the Alabama River ground sills, of the sort which have worked so successfully on the Rhone and other European rivers, to raise the bottom and thus diminish the depth of water, giving better water in some places over the shoals and in other cases increased currents for cutting away bars. These ground sills would be valuable auxiliaries to the works of contraction which have proved so successful in many cases.

As the river has a normal width of 500 to 600 feet from Wetumpka to Selma, and of 700 to 800 feet from Selma to the mouth, it follows that this width must be reduced about 350 feet between Wetumpka and Selma and 550 feet for the rest of the distance, in order to obtain the minimum width called for by the project. The total width of the surface of the water at many bars is much less than 200 feet. How, then, is a channel 200 feet wide to be maintained across these bars? Manifestly by reducing greatly the width of the pool above.

This means the construction of many miles of low-water dykes at great expense. No one can say how many miles will be needed. No data are available on the subject, nor can anyone say whether the commerce of the river will justify works so extensive.

No one can say what to do, because no one can say what should be done.

It is estimated that $176,200 can be expended profitably and advantageously during the year ending June 30, 1899.

This is divided as follows:

Dredging plant	$17,000
Local surveys preparatory to building contraction works	5,000
Office expenses	5,000
Ordinary repairs	2,500
Extraordinary repairs	3,500
Care of plant	6,000
Four stone barges	6,000
Two brush barges	2,000
Two pile barges	1,800
Two quarter boats	2,400
Expenses, snagging	10,000
Permanent structures	100,000
Dredging	15,000
Total	176,200

The various barges and quarter boats called for in the estimates are to replace those worn out in service. All these vessels are in such condition as to make it uneconomical to repair them. They are too small for their work, which thus becomes unnecessarily expensive.

The small appropriations given heretofore have not allowed a full utilization of the working plant which belong to the Alabama River. Two tow-boats, two pile drivers, two quarter boats, two brush barges, and four stone barges will be idle throughout the year ending June 30, 1898, for lack of funds necessary to keep them at work. The value of commerce on this stream is large. It is increasing all the time as the country becomes more populous.

Money statement.

July 1, 1896, balance unexpended	$40,940.31
June 30, 1897, amount expended during fiscal year	32,576.68
July 1, 1897, balance unexpended	8,363.63
July 1, 1897, outstanding liabilities	1,133.73
July 1, 1897, balance available	7,229.90
Amount (estimated) required for completion of existing project	246,251.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	176,200.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

June 18, 1878	$25,000	August 11, 1888	$20,000
March 3, 1879	30,000	September 19, 1890	20,000
June 14, 1880	25,000	July 13, 1892	70,000
March 3, 1881	20,000	August 18, 1894	50,000
August 2, 1882	20,000	June 3, 1896	40,000
July 5, 1884	10,000		
August 5, 1886	15,000	Total	345,000

COMMERCIAL STATISTICS.

The following statement of the business done by the steamboats named below during the fiscal year ending June 30, 1897, has been compiled from statements made by Capt. John Quill, of the steamer *Nettie Quill;* by Capt. H. Clay King, of the steamer *Carrier;* and by Capt. T. H. Moore, of the People's Line of steamers, plying between Mobile and Montgomery. No reports were rendered by the captains of the steamers *Minnie Lee* and *Alto,* as these were laid up during the past season:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Passengers carried.	Between—
		Light.	Loaded.			
		Inches.	*Feet.*			
Nettie Quill a	299	29	6	32	3,758	Mobile, Selma, and Montgomery, Ala.
Carrier	140.88	24	5	23	1,708	Do.
Tinsie Moore	198.29	30	5	64	8,288	Do.
Minnie Lee	98	24	5	.....	.....	
Alto	363.16	30	7	.....	.....	
Barge Tide	320	10	3	.....	.....	
Barge Wave	320	10	3	.....	.....	
Barge Nellie	320	10	3	.....	.....	
Barge Mary	320	10	3	.....	.....	

a New.

Freight carried.

Articles.	Quantity.	Equivalent in tons.
Cotton.....bales..	65,425	16,356
Cotton seed.....sacks..	138,243	13,824
Fertilizers.....do....	125,123	12,512
Hide and skins.....packages..	2,025	405
Live stock.....head..	2,900	1,450
Lumber.....feet B. M..	796,599	1,433
Staves.....pieces..	410,250	4,653
Provisions.....packages..	247,375	16,492
Grain.....sacks..	294,520	17,671
Miscellaneous freight.....packages..	104,125	1,570
Brick.....number..	60,000	125
Total.....	.....	96,536

Estimated value of above freight, in round numbers, $8,320,000. In addition to the commerce carried on by the above boats, which is about 30 per cent more than last year, there was a large increase in the rafting business on this river. Very great quantities of sawed and hewn timber, saw logs, lumber, and cord wood are rafted to Mobile annually, but available records of this business are not kept, and no estimate can be made.

P 10.

IMPROVEMENT OF COOSA RIVER, GEORGIA AND ALABAMA.

1.—BETWEEN ROME AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENT.

The Coosa River is formed by the Oostenaula and Etowah rivers, which have their source in the mountains of northern Georgia. The town of Rome, Ga., is situated at their junction. The Etowah is not navigable. The Oostenaula is formed by the junction of Coosawattee and Conasauga rivers, 60 miles northwest of Rome. The Oostenaula and its tributary, the Coosawattee, are navigable for light-draft boats the year round from Rome to Carters Landing, a distance of 105 miles. These rivers have been improved by works of contraction and channel excavation. There would be a continuous water route of transportation from Carters Landing to Mobile, Ala., an estimated distance of 815 miles, but for the shoals and rapids on the Coosa River, distributed over 137 miles from Greensport, Ala., to Wetumpka, Ala. This water route includes the Coosawattee, Oostenaula, Coosa, Alabama, and Mobile rivers.

Prior to 1823 the legislature of the State of Alabama passed "An act to improve the navigation of the Coosa River, and to aid in its connection with the Tennessee waters." In 1824 this act was formally approved by Congress.

In 1828 Congress provided that any surplus of the grant for improving Tennessee River should be applied to the improvement of the Coosa, Cahaba, and Black Warrior rivers.

It is not probable that much, if anything, was done under these acts, although steamboats have been plying on the Upper Coosa for some thirty years. (See Report of the Chief of Engineers for 1881.)

Between Rome, Ga., and Greensport, Ala., an estimated distance of

173 miles, the river is of such a character as to make its improvement by works of contraction and channel excavation entirely practicable.

From Greensport, Ala., to Wetumpka, Ala., a distance of 137 miles, the improvement will require the building of locks and dams in conjunction with channel excavation and works of contraction.

PROJECT.

The original project for the improvement of the Coosa River contemplated the opening of a continuous water route of transportation from the Mississippi River to the Atlantic Ocean by the way of the Ohio, Tennessee, Coosa, Etowah, Ocmulgee, and Altamaha rivers, with canals from the Tennessee to the Coosa and from the Etowah to the Ocmulgee. This was designated as the "Southern Route." The low-water depth and width of the channel proposed can not be stated from the records at hand.

Various surveys and examinations were made between the years 1870 and 1890 of the part of the Coosa under consideration, i. e., from Rome, Ga., to the Selma, Rome and Dalton Railroad Bridge, now known as the East Tennessee, Virginia and Georgia Railroad Bridge (hereafter in this report the latter designation will be used), an estimated distance of 245 miles. The following list gives the date of each and the estimates based upon them:

1870.—An examination from Greensport, Ala., to the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 72 miles. Estimated cost of improvement, $417,726.75.

1872.—A survey from Greensport, Ala., to the railroad bridge. No record can be found.

1874.—A survey from Rome, Ga., to the mouth of Wills Creek, 2½ miles below Gadsden, Ala., an estimated distance of 137 miles. Estimated cost of improvement, $180,000.

Summing up.—The total estimated cost of the improvement, determined from the above described surveys, is as follows:

From Rome, Ga., to the mouth of Wills Creek, in Alabama, an estimated distance of 137 miles	$180,000.00
From Greensport, Ala., to the East Tennessee, Virginia and Georgia Railroad Bridge, an estimated distance of 72 miles	417,726.75
Total	597,726.75

The estimated cost of the improvement from Rome, Ga., to the railroad bridge is given in the Report of the Chief of Engineers for 1877, as follows:

From Rome, Ga., to Wills Creek, in Alabama, an estimated distance of 137 miles	$81,679.00
From Greensport, Ala., to the railroad bridge, an estimated distance of 72 miles	470,668.00
Total	552,347.00

No survey has been made nor has an estimate been submitted for the improvement of that section of the river between Wills Creek and Greensport, Ala., an estimated distance of 36 miles. The only improvement here was made at Leota Reefs, about 1 mile above Greensport.

1890.—A survey from Lock No. 4, situated at the foot of Broken Arrow Shoals, to the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 48 miles. Estimated cost of improvement, exclusive of the cost of Lock No. 4, $945,145.

The contemplated improvement was to be made by works of contraction at the lesser obstructions and locks and dams at the greater.

The estimates for locks and dams were made for structures with crib-chamber walls filled with loose stones and masonry head and tail walls laid in cement. The dimensions of the locks were 200 feet between miter sills and 40 feet wide. Before the building of the locks were begun the length between miter sills was changed to 210 feet, and it was decided to build masonry structures laid in cement throughout. It was proposed to secure a low-water channel 3 feet deep and 80 feet wide. Below Lock 3 the width and depth was afterwards changed to 100 feet and 4 feet, respectively.

By an act of Congress approved July 13, 1892, the restrictions as to the size of the locks imposed by the act of Congress approved September 19, 1890, were removed.

Beginning with Lock No. 4, the size of the remaining locks was increased. It is now, length over all, 400 feet; length between miter sills, 322 feet; width, 52 feet; depth over sills, 7 feet.

The channel improvement from Lock No. 4 to the East Tennessee, Virginia and Georgia Railroad Bridge now contemplates a low-water depth of 7 feet and a width of 100 feet.

OPERATIONS TO JUNE 30, 1896.

A summary of the operations to June 30, 1895, is to be found in the Report of the Chief of Engineers for 1896, Part III, pp. 1409–1416.

1896.—Nothing was done during this year for lack of funds, the appropriation for 1894 having been exhausted June 30, 1895.

CONDITION OF THE IMPROVEMENT JUNE 30, 1896.

As a result of the improvement, the river has been made navigable the year round from Rome, Ga., to Harts Ferry, about 1 mile below Lock No. 3, or a total estimated distance of 180 miles.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

The appropriation of June 3, 1896, became available so near the close of the working season that this, coupled with the smallness of the appropriation, rendered it advisable to attempt no work on Lock No. 4 until the working season of 1897. During the interval, however, the work of assembling material for making concrete was resumed, and a small force has been employed at this work. The sand and gravel dredged for making concrete were taken from the channel at McCoy Island, where the channel has been widened to 100 feet through the gravel bar. When the water was too high for dredging at McCoy Island Shoals, the dredge was moved to Woods Reef, 1 mile above, and the channel there deepened to 3 feet. The break in Dam No. 4 has been temporarily repaired in order to preserve the head of water above the dam, so that materials for building the concrete floor at Lock No. 4 might be brought down the river during the working season of 1897. It is proposed to repair this break permanently as described under the head of "Recommendations and estimates." A small amount of dredging was done at the head of Box Shoals to make the entrance to the channel easier for boats. Some minor repairs were made to the cofferdam. The lower slope of the levee at the west abutment of Dam No. 4 was partly paved to protect it from the back wash of the dam.

The following statement shows the expenditures for the fiscal year ending June 30, 1897:

Disbursements July 1, 1896, to June 30, 1897	$17,320.18	
Less obligations July 1, 1896	1,401.18	
		$15,919.00
Material on hand, unexpended, July 1, 1896		27,157.63
Outstanding liabilities June 30, 1897		3,803.17
Total		46,879.80
Expenditures:		
Unexpended material and addition to plant		27,248.51
Channel work:		
Box Shoals, blasting and dredging	189.42	
McCoy Island Reefs, dredging 4,412 cubic yards	708.92	
Woods Reef, dredging 2,130 cubic yards	59.11	
		957.45
Concrete floor, assembling materials, etc.:		
Excavating for gravity incline to lock pit	172.85	
Grading storage yard and building bulkhead	531.08	
Building trestle in gravel yard	201.83	
Sand screening and concrete plant	492.75	
Repairs to trestle, delivering material from barges to storage yard	199.98	
Building concrete cars	373.29	
Delivering large stone, 320 cubic yards	597.53	
Operating steamer	2,291.56	
Screening sand and gravel, 2,332 cubic yards	1,068.19	
Crushing stone, 641 cubic yards	387.34	
Pumping	174.13	
		6,490.53
Miscellaneous:		
Repairs to Dam No. 4	571.40	
Repairs to cofferdam	20.24	
Paving levee, 64 cubic yards	28.90	
Testing cement and covering same	244.89	
General account, items not chargeable to any special work	1,115.47	
Care and preservation of property	2,072.05	
Expense account, traveling and transportation of funds	167.82	
Engineering and superintendence	5,866.56	
Expenses Montgomery office	1,333.34	
Repairs to steamer *Leota*	702.64	
		12,123.31
Lock No. 5:		
Recording gauge		60.00
Total		46,879.80

CONDITION OF THE IMPROVEMENT AT THE CLOSE OF THE FISCAL YEAR, JUNE 30, 1897.

The channel at all the different reefs and bars remains substantially as it was at the end of the last fiscal year, except at Woods and McCoy Island Reefs and Box Shoals. At Woods Reef the channel has been deepened to 3 feet at low water; at McCoy Island Reefs the channel through the gravel bar at the lower end has been widened to the full width of 100 feet and deepened to the full depth of 4 feet contemplated by the project; at the head of the channel the projecting point of rock was removed; at Box Shoals some loose rock has been removed from the channel at the head of the shoals.

RECOMMENDATIONS AND ESTIMATES.

Work has been going on in connection with this lock since 1885, when the detailed survey for the location of the lock and dam was made. The prosecution of the work has been hampered greatly by the character of the bed of the river and by the meagerness of appropriations. The small amounts of funds doled out from time to time cause the work to be carried on in a way both wasteful and extravagant.

The amounts needed to complete work which has been begun are as follows:

Lock No. 4:	
Extension of cofferdam	$4,830.00
Repairs and addition to plant	14,000.00
Finishing concrete floor	45,000.00
Masonry of lock walls	58,647.40
Gates, valves, maneuvering machinery, etc	12,000.00
Excavation and paving below lock	15,000.00
Longitudinal dam and guide crib above lock	12,000.00
Removing cofferdam, filling behind land wall, tearing down temporary buildings, and grading yards	15,000.00
Contingencies 10 per cent	17,647.74
Total for Lock No. 4	194,125.14

The dam of Lock No. 4 was greatly damaged during the past winter by logs passing over it. A large breach was made near the center. To repair this breach and raise the dam 3 feet, as approved, will cost $32,000.

The dredging and blasting in the channel between Locks 3 and 4 will cost—

At Box Shoals	$13,475
At McCoy Island Reef	1,000
At Alligator Reef	6,222
At Formby Reef	1,500
At Hunnicutt Reef	2,000
At Whiteside Bar	2,500
At Lonnergan Reef	4,000
Total for channel work	30,697

These sums added together give—

For finishing Lock No. 4	$194,125.14
For repairing and raising Dam 4	32,000.00
For channel work	30,697.00
Total	256,822.14

which amount can be expended economically and profitably during the year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended	$57,305.68
June 30, 1897, amount expended during fiscal year	17,320.18
July 1, 1897, balance unexpended	39,985.50
July 1, 1897, outstanding liabilities	3,803.17
July 1, 1897, balance available	36,182.33
Amount (estimated) required for completion of existing project	800,133.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	256,822.14
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

August 14, 1876	$30,000	August 11, 1888	$60,000
June 18, 1878	75,000	September 19, 1890	150,000
March 3, 1879	45,000	July 13, 1892	130,000
June 14, 1880	75,000	August 18, 1894	110,000
March 5, 1881	60,000	June 3, 1896	50,000
August 2, 1882	83,700		
July 5, 1884	50,000	Total	963,700
August 5, 1886	45,000		

COMMERCIAL STATISTICS.

The following commercial statistics are reported by the White Star Line Steamboat Company and the Lathrop-Hatten Lumber Company:

Stern-wheel steamboat—	Registered tonnage.	Draft.		Passengers carried.	Round trips.	Between—
		Light.	Loaded.			
		Inches.	*Feet.*			
Clifford B. Seay	115	20	5	2,725	28	Rome, Gadsden, Greensport, and locks 1, 2, 3 and 4.
Resaca	82	16	4	1,140	54	Do.
Tony	30	12			19	Do.
					1	Rome to Carters, Ga.

Freight carried.

Articles.	Quantity.	Tons.
Cotton, bales	18,000	2,700
Cotton seed, sacks	9,000	544
Fertilizers, do	32,000	3,200
Hides and skins, packages	80	4
Live stock, head	290	140
Lumber, feet	9,500,000	32,000
Staves, pieces	1,100,000	1,000
Provisions, packages	40,000	1,900
Grain, sacks	100,000	5,100
Miscellaneous freight, packages	70,000	8,025
Total		54,613

Estimated value of above freights in round numbers, $1,800,000.

2.—BETWEEN WETUMKA AND EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

DESCRIPTION AND CONDITION BEFORE IMPROVEMENT.

The original condition of the part of the Coosa River between the East Tennessee, Virginia and Georgia Railroad Bridge and Wetumka, Ala., was such as to make navigation entirely impossible. The channel way was formed of a series of short, deep pools, seldom more than a mile in length, separated from each other by wide shoals, some of which are as much as 12½ miles in length.

There was no navigation existing on the river, neither had there ever been any, unless floating cotton down the river on flatboats which never returned can be called navigation. These flatboats used to go down the river to Mobile at high water. Since the construction of

railways which are able to move the cotton crop to different seaports this part of the river has never been used.

During the summer and fall of 1889 a hurried survey was made of the part of the Coosa River lying betwcen Lock 4 and Wetumka, Ala. As a result of this survey, the following project was prepared:

To construct 27 locks and dams of varying lifts; to have a uniform available length of 280 feet and width of 52 feet between No. 4 and Wetumka, the last one of the series, No. 31, being at the last-named place. No lift of lock was to exceed 15 feet. In addition to these locks and dams the channel was to be cleared of various rock reefs and points. The depth of water proposed was 4 feet, so far as the channel work was concerned, and 6 feet for the locks. The total estimated cost of the work was $6,074,913.

The river and harbor act of 1890 reduced the length of the proposed locks to 210 feet between hollow quoins and the width to 40 feet. The project was modified on this basis and the total cost placed at $6,038,219.

The river and harbor act of 1892 restored the dimensions proposed originally for the locks.

OPERATIONS TO JUNE 30, 1896.

A summary of the operations on this part of the Coosa River to June 30, 1895, is given in the Report of the Chief of Engineers for 1896, Part III, pages 1419–1420.

1896.—The walls of Lock No. 31 were completed, the space between the land wall and the bank was filled in, the temporary staging and a part of the cofferdam were removed.

The rock excavation in the channel above the lock was finished as far as it could be until the water shall have been backed up by the dam.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1897.

The most important work of the season was the removal of the cofferdam, of which the downstream return wall in front of the lower gateway was removed to a depth of nowhere less than 8 feet below low water level; the river wall, built in shallower water, was removed entirely, and the upstream return wall was removed to a depth of nowhere less than 3 feet below the level of the upper miter sill. Most of the crib work was pulled apart by a steam derrick, but that portion of the lower end which was in deep water was blown out with dynamite. The timber and sheeting obtained was stacked away in the lock yard for future use; the drift bolts were straightened out, repointed, and stored. The total cost of the removal of the dam and storing away the material was as follows:

Emptying cribs, taking them apart, and putting away lumber and other materials:	
Labor	$5,470.65
Superintendence	428.50
Coal	267.98
Explosives	68.50
Erecting steam derrick on barge	71.24
Total	6,306.87

The gate anchorages and the snubbing posts, which were received at the end of the last fiscal year, were set in place, and the concrete work finished around the former; the gudgeon straps and adjusting screws were fitted, marked for their respective places, and stored.

Some slight settlement of the filling behind the land wall of the lock took place soon after it had been deposited; the low places were filled up. No further settlement occurred. During the high water of the following winter the current cut away the filling immediately behind the upper wing wall to a greatest depth of 5 feet. This was replaced. The surface was covered 1 foot deep with broken stone, which had been removed previously from the stone bin, and a stone wall 4 feet high by 4 feet wide was built along the back of the wing wall and returned about 20 feet down behind the upper gateway. This, it is expected, will prevent any further scour.

All of the plant and tools used on the work were cleaned, put into proper repair, and stored.

Preparations were made for the detailed surveys at the sites of Locks Nos. 9, 10, and 11 recommended by the Board of Engineers. The party went into camp on June 1, 1897, and the surveys are now going on.

CONDITION OF IMPROVEMENT JUNE 30, 1897.

The construction of Lock No. 31 is completed with the exception of the lock gates, filling and emptying valves, and the operating machinery, none of which is it advisable to put in until there is some prospect of the lock being required for navigation. If placed in position now these parts would begin immediately to deteriorate and, though never used, would require constant attention, and probable repairs from time to time. It is also quite possible that they might become obsolete in style before being required for navigation purposes.

For similar reasons the permanent dam has not been built, as it would not only require attention and probable repairs, but it would increase somewhat the depth of water on the site of the next lock above, thereby making the construction of that lock proportionately more troublesome and expensive.

The channel work immediately above Lock No. 31 has been completed so far as possible until the creation of the upper pool renders it feasible to remove more economically a small portion of the rock which has been shattered but which could not be taken out owing to the present strength of the current.

RECOMMENDATIONS AND ESTIMATES.

An improvement of the cost and importance of that proposed for the Coosa River is such that it can be carried on with economy and efficiency only by means of large and steady appropriations. At the rate at which appropriations have been given for this river up to the present time, it will take from one hundred and fifty to two hundred years to finish the work on the approved project, which will have become antiquated long before that time, judging by the rate at which improvements have been made in transportation facilities during the last few years.

If no improvement is to be made in the present rate of work, it will be much better to abandon the improvement; and I do not hesitate to recommend that it be abandoned. If it is to be continued and carried on in the way that work of such magnitude should be carried on, viz, with large and regular appropriations, $1,000,000 could be expended judiciously during the fiscal year ending June 30, 1899.

Money statement.

July 1, 1896, balance unexpended	$66,191.24
July 30, 1897, amount expended during fiscal year	20,360.45
July 1, 1897, balance unexpended	45,830.79
July 1, 1897, outstanding liabilities	1,240.41
July 1, 1897, balance available	44,590.38
Amount (estimated) required for completion of existing project	4,683,074.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	1,000,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

APPROPRIATIONS.

September 19, 1890	$150,000
July 13, 1892	100,000
August 18, 1894	110,000
June 3, 1896	50,000
Total	410,000

REPORT OF BOARD OF ENGINEERS UPON IMPROVEMENT OF COOSA RIVER, GEORGIA AND ALABAMA, BETWEEN WETUMKA, ALA., AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., January 30, 1897.

GENERAL: The Board convened by Special Order No. 42, dated Headquarters, Corps of Engineers, Washington, D. C., November 19, 1896, and Special Order No. 48, dated December 29, 1896, to consider and report upon the subject of improvement of the Coosa River between Wetumka, Ala., and the East Tennessee, Virginia and Georgia Railroad Bridge, met at 10.45 a. m., January 5, 1897, at the United States Engineer Office in Montgomery, Ala., all the members and the recorder being present. The Board met daily thereafter at the same place, all the members and the recorder being present upon each occasion, until January 8, 1897, when the Board finally adjourned. On January 7 the Board made a visit to and an examination of the lock which is partially constructed at Wetumka, Ala., and the channel work in that immediate neighborhood. During its sessions the Board examined the maps of surveys of this river and all plans and projects of the improvement on file in the office. Major Mahan, in charge of the district, together with his assistant, Mr. Charles Firth, who made the surveys of the river upon which the existing project is predicated, and who has been in local charge of all work done, appeared before the Board whenever requested, giving all desired information, and assisted in various ways the investigation made by the Board.

The instructions of the Board direct attention specifically to the question whether such small sums as have been heretofore appropriated by Congress can be applied with advantage to the public interest in this work, involving the construction of twenty-three locks and dams, and direct that the Board give the whole subject careful study and submit its report at as early a date as practicable. In compliance with these instructions the Board has labored diligently to acquire all avail-

able information and to arrive, by means of free and full discussion, at conclusions which express their unanimous opinion.

The river and harbor act of August 11, 1888, provides as follows:

SEC. 13. That the Secretary of War is hereby directed, at his discretion, to cause examination or surveys, or both, to be made, and the cost of improvement to be estimated, at the following localities, to wit: In the States of—

* * * * * * *

The Secretary of War is hereby authorized and directed to cause a survey to be made at the earliest practicable time for the location of a channel in and along the Coosa River, in Alabama, from the rapids at Wetumka, to connect with the improvements already completed on said river above the Ten Islands, and to direct the engineer making the survey to report as to the most feasible, economical, and suitable plan for making such improvement.

* * * * * * *

SEC. 14. * * * *Provided*, That no survey shall be made of any harbors or rivers until the Chief of Engineers shall have directed a preliminary examination of the same by the local engineer in charge of the district or an engineer detailed for the purpose, and such local or detailed engineer shall report to said Chief of Engineers whether, in his opinion, said harbor or river is worthy of improvement, and shall state in such report fully and particularly the facts and reasons on which he bases such opinion, including the present and prospective demands of commerce; and it shall be the duty of the Chief of Engineers to direct the making of such survey if, in his opinion, the harbor or river proposed to be surveyed be worthy of improvement by the General Government; and he shall report to the Secretary of War the facts, and what public necessity or convenience may be subserved thereby, together with the full reports of the local engineer. * * *

A circular letter from the office of the Chief of Engineers, dated September 29, 1888, required the district engineer at Montgomery, Ala., to make a preliminary examination of this locality as soon as practicable, and to state whether in his opinion the locality is worthy of improvement, to give fully and particularly the facts and reasons on which he based such opinion, including the present and prospective demands of commerce, and to "submit a rough estimate or opinion as to what the improvement desired would cost," whether the locality were deemed worthy of improvement. The report submitting this preliminary examination is dated November 24, 1888, will be found in the Annual Report of the Chief of Engineers for 1890, page 1658, and was published in House Ex. Doc. No. 94, Fifty-first Congress, first session. The general scope of the report is shown by the following extracts:

A survey of this river was made in 1870–71 between Wetumka and the Selma, Rome and Dalton Railroad Bridge, with a reconnaissance from this point to Greensport, above the Ten Islands. In 1872 a partial instrumental survey was made covering the limits of this reconnaissance, and in 1878 another partial survey of the river between Wetumka and the Selma, Rome and Dalton Railroad Bridge. While the data remaining from these surveys afford material for a preliminary report, they are not sufficient for an accurate estimate of the cost of the improvement proper to be made. In my opinion this river is worthy of improvement, and the cost of a survey which is necessary for the report contemplated by the act, including a project with estimate of the cost of the improvement, will be $6,000.

* * * * * * *

For a complete system of continuous slack-water navigation, with minimum channel depth of 6 feet and having locks 52 feet wide and 320 feet between miter sills, the cost may be roughly estimated as follows:

Thirty-three locks and dams having an average lift of 10 feet and guard of 8 feet (or their equivalent), at $190,000 each	$6,270,000
Removal of rock obstructions (uncertain)	400,000
Total	6,670,000

It seems more probable that the foregoing rough estimates will be reduced by a careful survey than that they will be increased. Until definite locations of locks and dams are decided upon, the precise number can not be stated. If continuous slack-water navigation be preceded by the completion of 3-foot navigation with

locks of increased dimensions, the simple expedient of the raising the dams will probably contribute largely to the completion of continuous 6-foot slack-water navigation. Whether a progressive development of the 6-foot slack-water navigation will materially increase the cost of the latter can only be determined after the completion of detailed surveys. The inauguration of 6-foot navigation upon the Coosa must be followed by a corresponding improvement of the Alabama.

The public necessity and convenience that may be subserved by the contemplated improvement of the Coosa River have been stated at length in a memorial addressed to the Congress of the United States by the Coosa River Improvement Convention, assembled at Montgomery, Ala., March 15, 1887. From this source I present the following statement of facts and deductions therefrom, which I believe to be substantially correct. The convention comprised the representative business men of Alabama, and was presided over by the Hon. Thomas Seay, governor. The memorial was prepared by a committee of fifteen gentlemen whose names are sufficient guaranty of conscientious performance of the duty intrusted to them.

The memorial referred to is a comprehensive exhibit of the resources of the valley of the Coosa River and its tributaries, showing more especially its mineral resources, with the stage of development at that time and the probable further development which would follow the opening of the Coosa River to navigation.

Letters of March 12 and 26, 1889, from the office of the Chief of Engineers, allotted $6,000 for a survey, which the district engineer was directed to make. The report of this survey appears in the Annual Report of the Chief of Engineers for 1890, page 1665, and is published in House Ex. Doc. No. 94, Fifty-first Congress, first session. The general scope of this report, and the precise character of the improvement contemplated to be made by the expenditure of the amounts named as the estimated cost, are shown by the following brief extracts from the report:

The bottom of the river throughout is rocky, composed of solid ledges of loose rocks and bowlders, with an almost total absence of sand or gravel bars.

The normal width of the river at low water is from 600 to 800 feet. At "The Narrows" it contracts to 400 feet, with a depth of over 85 feet. The greatest width is 3,700 feet at Butting Ram Shoals, where the water is very much dispersed and the river bed is an intricate mass of rocks, reefs, and islands.

* * * * * * *

Suitable stone for first-class rock masonry is found in both sections—in upper, blue limestone, and in the lower, gneiss.

PLAN OF IMPROVEMENT PROPOSED.

In accordance with the terms of the act of Congress, I have to recommend that "the most feasible, economical, and suitable plan" for opening to navigation the part of the river under consideration is to provide a system of slack-water navigation over the greater part of the distance by the construction of dams or dikes to back up the water over the swift, shallow portions, and of locks to pass boats from one level to another; and, in addition, to excavate suitable channels through the reefs by blasting out or removing the rock where necessary.

* * * * * *

To determine the precise location of the locks and dams and the heights of the tops of the lock walls above the dam, detailed surveys and discharge observations will, of course, be required at each locality selected, but these need not be made until appropriations for the work become available. No further surveys are needed for the adoption of a general plan of improvement.

To improve the 116½ miles of the river between Lock 4 and Wetumka, 27 locks, with a total lift of 300 feet, will be required, which, in the tables herewith, are numbered consecutively from No. 5 to No 31—the last of the series at Wetumka.

* * * * * * *

The estimates submitted for rock excavation provide for a channel 100 feet wide and 4 feet deep at extreme low water, through such reefs and shoals as are not drowned out by the dams.

A depth of 6 feet was not provided for, because extreme low water occurs so seldom and is of so short duration that it was not deemed advisable, for the present, to recommend the much greater expenditure required to procure it. The depth of the miter sills of the locks at extreme low water having been fixed at 6 feet, should the demands of commerce at any time in the future require a minimum depth of 6 feet in the channels no change will be necessary in the locks.

Upon the foregoing basis of work to be done, the total estimated cost is $6,074,913. This includes all the river from Wetumka to Lock No. 4. The latter, however, is 48 miles above the East Tennessee, Virginia and Georgia Railroad Bridge, and four of the locks provided for in the estimate lie in this section. The instructions of the Boards are to report upon the subject of improvement of Coosa River between Wetumka, Ala., and the East Tennessee, Virginia and Georgia Railroad Bridge. The total estimated cost of this section of the river, based on Captain Price's figures, is $5,106,422. The question as to whether this section of the river is worthy of improvement to the amount of the foregoing estimates does not seem to require consideration. The Board has no other data bearing on this matter than that contained in the Report of the Chief of Engineers, and Congress has accepted the decision of the district engineers, the Chief of Engineers, and the Secretary of War that it is worthy by making successive appropriations to the amount of $410,000.

The main questions as they appear to the Board are, first, will the estimates be largely exceeded in actual construction; and, second, can such small sums as have heretofore been provided by Congress be applied with advantage to the public interests.

Major Mahan stated to the Board that in his opinion the estimates will be largely exceeded. He bases his opinion chiefly on the fact that Lock No. 31, so far as already completed, has cost much more than the estimates, but he admitted that his judgment was partially based on a misapprehension of the depth required by the approved project.

The profile of the river between Wetumka and Lock No. 4 shows a total difference of elevation between low water at Wetumka and low water at the site of Lock No. 4 of 322.73 feet. The total lift provided by the 27 locks and dams proposed is 300 feet, leaving 22.73 feet to be overcome by the natural slope of the water between certain of the locks.

It is clear that the project accompanying these estimates did not provide a continuous slack-water navigation, but for a combination of slack water with open river navigation, giving a least depth of 4 feet in the channel and of 6 feet on the miter sills of the locks at low water. The only change in this project which the Board has been able to find affects simply the dimensions of the locks. The river and harbor act of September 19, 1890, provides that "the locks shall be 40 feet wide and 210 feet between miter sills," but the river and harbor act of July 13, 1892, provides that "the restrictions as to the size of the locks to be constructed on the Coosa River placed in the river and harbor act of September 19, 1890, is hereby repealed," and the project remains as first presented. As a matter of fact, however, the work which has been done under this project upon Lock 31, the last of the series, but which had to be first undertaken because of the condition imposed by the act of September 19, 1890, is not in accordance with this project, nor is the channel work in this immediate vicinity. The depth on the miter sills of this lock is 8 feet instead of 6, and whereas no channel work was contemplated in this vicinity, channel work has been done to the extent of 43,160 cubic yards, excavated to a depth of 6 feet instead of 4 feet at low water. This work has all been done under proper authority, and is a great improvement upon the original plans, but it is not contemplated in the estimates, and the Board is of the opinion that this difference in the character and magnitude of the work done, as compared with that contemplated by the estimates, will account to a considerable extent for the discrepancy between the estimated and actual

cost. As a matter of fact, the river seldom goes down to the low-water stage. For the greater part of the year it keeps from 1 to 3 feet above that level, so that in reality a 4-foot navigation in the river with 6 feet on the miter sills of the locks gives a navigable depth of nearly 6 feet the greater portion of the year.

The Board is of the opinion that while the estimated cost may be somewhat increased there does not seem to be sufficient reasons to apprehend a very great increase, provided the appropriations be made with regularity and in sums sufficient for economical prosecution, and that this can best be done by putting the entire work under the continuous-contract system.

Appropriations in such small sums as have heretofore been given can not be applied with advantage to the public interests. This is a work of great magnitude. With ample appropriations it will take years to build it, but with biennial appropriations of $50,000 it will take more than two hundred years to complete, and long before it is finished much larger sums than $50,000 will be required annually for maintenance alone.

The Board, in view of the foregoing, is of the opinion that all work of construction should for the present be discontinued, and that an allotment from the funds available should be made for the necessary detailed surveys at the sites of Locks Nos. 9, 10, and 11, in order that plans for the works of those points may be in readiness when the necessary appropriations shall be made. If the work is to be continued, appropriations for the part of the river below the East Tennessee, Virginia and Georgia Railroad Bridge of not less than $500,000 should be made annually, and the work carried on from both ends simultaneously. It requires fully two years to build one lock and dam, and as there are 23 to be built the necessity for simultaneous construction at two or more points is apparent. The work may be prosecuted more rapidly and advantageously by working both at the two ends and in the middle. In this way about $800,000 per annum can be economically expended and the work probably completed in five or six years.

Respectfully submitted.

PETER C. HAINS,
Colonel, Corps of Engineers.
R. L. HOXIE,
Major, Corps of Engineers.
WM. T. ROSSELL,
Major, Corps of Engineers.
WM. E. CRAIGHILL,
First Lieutenant, Corps of Engineers, Recorder.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

P 11.

OPERATING AND CARE OF CANALS AND OTHER WORKS OF NAVIGATION ON COOSA RIVER, GEORGIA AND ALABAMA.

Locks Nos. 1, 2, and 3 were opened to navigation June 30, 1890, and have been operated continuously without interruption to navigation. In February, 1895, the canal between Locks Nos. 2 and 3 was frozen over for ten days, thus closing the canal to navigation during that period.

The amount expended to the end of the fiscal year ending June 30, 1896, was $34,559.08.

During the fiscal year ending June 30, 1897, the following expenditures were made:

Lock No. 1:		
Lock keeper's salary, 12 months at $50	$600.00	
Repairs to main dam	352.64	
Dredging channel immediately above and below the lock	426.83	
Removing silt, etc., from lower gates	36.48	
Building small oil and tool house	16.12	
Repairs to Government road	23.56	
		$1,455.63
Lock No. 2:		
Lock keeper's salary, 12 months at $50	600.00	
Building small oil and tool house	16.04	
Building upper guide pier	879.59	
Cutting ditch back of guide pier	209.76	
Repairs to main dam	163.81	
Whitewashing fence and repairs	8.09	
		1,877.29
Lock No. 3:		
Lock keeper's salary, 12 months at $50	600.00	
Cutting drain ditch back of lock	61.80	
Four covers for culvert manholes	155.34	
Repairs to Government road	45.32	
		862.46
Miscellaneous:		
Boom and turntable for 1¼ yards dipper for dredge		1,525.33
Current and contingent expenses:		
Value of property purchased	4.24	
Engineering and superintendence	329.10	
Expenses traveling and transportation of funds	22.20	
Expenses Montgomery office	216.67	
		572.21
Total		6,292.92

Money statement.

July 1, 1896, balance unexpended	$6,325.00
June 30, 1897, amount expended during fiscal year	6,137.92
July 1, 1897, balance unexpended	187.08
July 1, 1897, outstanding liabilities	155.00
July 1, 1897, balance available	32.08

P 12.

SURVEY OF APALACHICOLA BAY, FLORIDA, AND THE APPROACHES TO APALACHICOLA.

[Printed in House Doc. No. 129, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 17, 1896.

SIR: The river and harbor act of June 3, 1896, provides for a survey of Apalachicola Bay, Florida, and the approaches to Apalachicola, with a view to obtaining a channel 100 feet wide and 18 feet deep at low water.

The duty of making this survey was assigned to Maj. F. A. Mahan, Corps of Engineers, and I have now the honor to submit the accompanying report of September 17, 1896, by that officer, with map,* on the subject.

*Not reprinted. Printed in House Doc. No. 129, Fifty-fourth Congress, second session.

The plan of improvement proposed by Major Mahan contemplates the making of a channel 18 feet deep at low water, 150 feet wide at the bottom, from Apalachicola for a distance of about 10 miles through West Pass, which he estimates will require the dredging of 3,154,687 cubic yards, at a cost, in round numbers, of $350,000, founded on the supposition that the work will be let in one contract. He further states that about $20,000 or $30,000 a year will be required to maintain the part of the channel nearest the town after the required depth has been obtained.

Col. Peter C. Hains, Corps of Engineers, the division engineer, in forwarding the report, states:

> I have grave doubts whether the improvement recommended can be carried out at the estimated cost, and still graver doubts whether it can be maintained at from $20,000 to $30,000 per annum. In other words, the estimates of cost and maintenance are both too low.

The plan presented by Major Mahan is in accord with the requirements of Congress, and the estimates presented may, under favorable conditions, be sufficient for "obtaining a channel 100 feet wide and 18 feet deep at low water," from deep water of the Gulf to Apalachicola; but considering the nature of the material through which the channel is to be dredged, it is not believed the entire channel can be maintained except at great expense; probably not less than $50,000 per year. Additional work which would make a portion of the channel comparatively permanent and reduce cost of maintenance to possibly $25,000 per annum is practicable, but the expense of such additional work would be very great.

It seems expedient, therefore, to ask the attention of Congress to the fact that the execution of the project herein presented involves not only a large first cost, but a continuous heavy annual expenditure so long as the improvement is to be maintained; and experience on similar improvements indicates that the cost of securing and maintaining any certain depth of channel through such a bay as this is a most indeterminate quantity.

The object of the desired improvement is to avoid the lightering of lumber and other products from the city of Apalachicola through the bay to water sufficiently deep for ocean vessels; but the depth proposed will only partially accomplish this object, and to permit the entrance of ocean freight steamers of average draft a further deepening of the channel will be necessary. The additional cost of such further deepening of channel and the additional cost for its maintenance should properly be taken in account in considering the relative cost and value of the improvement.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. F. A. MAHAN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Montgomery, Ala., September 17, 1896.

GENERAL: The river and harbor act of June 3, 1896, directed the Secretary of War to cause certain surveys to be made and the cost of improvement to be estimated at various localities, one of which is the

following: "Apalachicola Bay, Florida, and the approaches to Apalachicola, with a view to obtaining a channel 100 feet wide and 18 feet deep at low water."

Your letter of July 24, 1896, requests me to submit to your office at as early a date as practicable an estimate of the cost of making this survey.

As the United States Fish Commission was engaged during the winter of 1895–96 in making a survey of Apalachicola Bay, it was not deemed necessary to go over the ground which it had already covered.

I wrote, therefore, to the United States Commissioner of Fisheries and asked him to have the kindness to let me have a tracing of the survey made last winter.

The tracing was sent to me, and from it was made the blue print accompanying this letter.

There are two lines of approach to Apalachicola which may be considered in this connection, one being to the southwestward through the West Pass, which lies between St. Vincent Island and Sand Island, the other to the eastward through the eastern end of Apalachicola Bay and St. Georges Sound, through what is known as the East Pass, which lies between St. Georges Island and Dog Island. I have not considered the second line of approach on account of its great length, being over 22 miles, and the large amount of work which would be required in order to obtain the sort of channel needed. To be sure, the present anchorage ground of vessels visiting Apalachicola is just inside of Dog Island, and the approach through the East Pass from the anchorage is better than the approach through the West Pass. The great facility with which deep-water dredging in sand is performed makes the quantity of dredging which would be required at the West Pass a very small feature as compared with the quantity of dredging which would have to be done between Apalachicola and the anchorage near Dog Island.

The distance from Apalachicola to Dog Island anchorage is about 22 miles, of which distance 20 miles would have to be dredged to a greater or less extent, the cut in some places being as much as 14 feet deep.

The length of the three channels indicated on the blue print sent herewith is as follows: The branch of the channel leading southward from Apalachicola, $2\frac{1}{4}$ miles; the main channel, working off well to the westward, $5\frac{1}{2}$ miles, and the small channel opposite Sand Island Pass, which I call the "link channel," on account of connecting the two areas of greater depth than 18 feet, $1\frac{1}{8}$ miles. This makes a total length of $8\frac{7}{8}$ miles; or if we add a distance of approximately $1\frac{1}{8}$ miles across the bar outside the West Pass, we have in all a distance of 10 miles, over which we have to work, where the cutting is comparatively light.

In the first, viz, in the channel nearest Apalachicola, the cutting varies from 1 foot in depth to 14 feet, the average depth being about 8 feet; in the next section of the channel the average depth of cutting will be about 6 feet; in the link channel the cutting will scarcely be more than 1 foot, while on the bar outside the West Pass it will not exceed 4 feet in any event.

A channel leading to the eastward of Dog Island Bar would give an average cutting of certainly 10 feet in depth for a distance of 18 miles.

Under these conditions it seemed to me that it was unnecessary to consider the channel from Dog Island; therefore I have considered only the channel leading to the West Pass.

Estimating a channel 18 feet deep below low water and 150 feet wide

at the bottom, with side slopes of 1 on 6, which is as steep as the material composing the bottom of Apalachicola Bay can be expected to stand, the amounts of dredging are as follows:

	Cubic yards.
Old dredged channel, 2¼ miles long	882, 646
Main channel, 5½ miles long	2, 103, 425
Link channel, 1⅛ miles long	68, 356
West Pass channel (approximate)	100, 000
Total	3, 154, 687

Judging by the prices for which work similar to this has been done at Mobile, this work ought not to cost over 10 cents a cubic yard, which would give as the cost of the work $315,468.70, or adding, say, 10 per cent for contingencies, $347,015.57, or, say, $350,000 in round numbers.

This figure of $350,000 is founded on the supposition that the work will be let as one contract.

The commerce of Apalachicola is quite important, and amounts to over $3,500,000 a year, as stated by the collector of customs, who is also the president of the board of trade of the town.

There can be no doubt that a channel of this sort would tend greatly to develop the commerce of the town and would remove an onerous tax which now exists from the necessity of having to lighter everything in the way of lumber and naval stores and other products, which are the main features of the town's trade, from warehouses in the town to vessels lying outside.

While 10 per cent of the present value of the town's trade seems to be a large outlay to be made all at once for an improvement of this sort, I am of the opinion that the prospective benefits would justify the doing of the work.

Another question, however, has to be considered, and that is the maintenance of the channel after it shall have been obtained. Experience has shown that a channel leading across the bar at the mouth of Apalachicola River can only be maintained by constant dredging. The present project calls for a channel through this bar 11 feet deep and 200 feet wide. The width proposed has never been obtained. The depth proposed has been obtained once or twice. As a general rule, the channel has never exceeded 9½ feet, and this is only on the completion of any dredging work which may have been done from time to time. After the dredge ceases work, the channel fills up very rapidly with silt from the river, and there is no doubt that the same operation will go on with this channel, in case it should be dug. There is no saying to what extent this channel will fill up, as the data in possession of this office are insufficient to state this positively, or even approximately, but experience has shown that it will certainly cost not less than $20,000 or $30,000 a year to maintain the part of the channel nearest the town after it shall have been obtained. This, however, is only 1 per cent on the present value of the commerce of the town, taking it at its largest figure, and certainly it can not be regarded as excessive. If the commerce of the town should increase, as it is more than likely it will with an improved channel, the percentage of cost on the value of the commerce will be reduced greatly.

As for the remainder of the channel, beginning at the angle formed from the old dredged channel out through the main channel, I am of the opinion that while there will be filling, it will be exceedingly slow. There seems to be a general filling going on all over Apalachicola Bay, but it does not amount, so far as I can make out from comparison of maps of various dates, to more than about an inch a year; consequently

the amount of work necessary to keep the channel clear under these conditions will be exceedingly small.

Taking everything into consideration, I consider that this improvement is one worthy to be made.

Very respectfully, your obedient servant,

F. A. MAHAN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., September 21, 1896.

Respectfully submitted to the Chief of Engineers, United States Army.

I have grave doubts as to whether the improvement recommended can be carried out at the estimated cost, and still graver doubts whether it can be maintained at from $20,000 to $30,000 per annum. In other words, the estimate of cost and maintenance are both too low.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

APPENDIX Q.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN ALABAMA AND EASTERN MISSISSIPPI, AND OF BOGUE CHITTO, LOUISIANA.

REPORT OF MAJ. WM. T. ROSSELL, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Mobile Harbor, Alabama.
2. Black Warrior River, Alabama, from Tuscaloosa to Daniels Creek.
3. Operating and care of locks and dams on Black Warrior River, Alabama.
4. Warrior and Tombigbee rivers, Alabama and Mississippi.
5. Noxubee River, Mississippi.
6. Pascagoula River, Mississippi.
7. Chickasahay River, Mississippi.
8. Leaf River, Mississippi.
9. Pearl River below Jackson, Mississippi.
10. Pearl River between Carthage and Jackson, Mississippi.
11. Pearl River between Edinburg and Carthage, Mississippi.
12. Bogue Chitto, Louisiana.
13. Survey for canal from Birmingham, Ala., to the Warrior River.

EXAMINATIONS.

14. Canal to connect Black Warrior River and Five Mile Creek, Alabama, via Valley Creek.
15. Ship Island Pass, Mississippi, for channel from Gulf of Mexico to Ship Island Harbor and Gulfport.

SURVEYS.

16. Horn Island Pass, Mississippi, and passage to anchorage inside Horn Island.
17. Pascagoula and Dog rivers, Mississippi.
18. Ship Island Harbor, in Mississippi Sound.
19. Channel at mouth of Pearl River, Mississippi.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., July 19, 1897.

GENERAL: I have the honor to forward herewith annual report * * * for the fiscal year ending June 30, 1897, for the works of rivers and harbors under my charge.

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

Q 1.

IMPROVEMENT OF HARBOR AT MOBILE, ALABAMA.

ORIGINAL CONDITION OF WORK.

For original condition of this work, see pages 1425 and 1426, Annual Report of 1896. For maps of Mobile Bay from 1764 to 1820, see page 1432, Annual Report of 1896.

PLAN OF IMPROVEMENT.

The present plan of improvement is for maintenance of the channel by dredging.

WORK PRIOR TO JUNE 30, 1896.

For work prior to June 30, 1896, see pages 1426, 1427, 1428, and 1429, Annual Report for 1896.

WORK OF THE PAST YEAR.

Work under the joint resolution of Congress, approved March 16, 1896, was continued and completed.

The dredges employed were the *Bismarck* and the *Chas. Fobes.* They are both "clam-shell" dredges, the *Bismarck* having a capacity of bucket of 10 cubic yards and the *Chas. Fobes* of 5 cubic yards. Both dredges worked day and night. During the year the *Bismarck* removed 523,484 cubic yards and the *Chas. Fobes* 406,144 cubic yards, a total of 929,628 cubic yards, which, together with 1,148,294 cubic yards of material, chiefly very soft blue mud or clay, removed by the contractor, the National Dredging Company, of Wilmington, Del., up to June 30, 1896, makes a grand total of 2,077,922 cubic yards removed under the joint resolution of Congress, approved March 16, 1896.

The following averages were made by the dredges on the above work, from its commencement on April 18, 1896, to its completion on September 5, 1896:

The *Bismarck* removed 1,147,825 cubic yards, being an average of 58,454 cubic yards per week and 10,628 cubic yards per day of twenty-four hours.

The *Chas. Fobes* removed 930,097 cubic yards, being an average of 47,366 cubic yards per week and 8,612 cubic yards per day of twenty-four hours.

By limitation of contract, the funds being exhausted, dredging operations were suspended on September 5, 1896.

The result obtained under this contract was a redredged channel from the Mobile Bay light-house on Fowl River reefs, on Station K, down to the 23-foot curve in the lower Mobile Bay, giving a channel of variable width and 23 feet deep at mean low water through the very soft material in the lower bay, where shoaling had occurred to a considerable extent, and making the entire channel from the wharves at Mobile to the Gulf of Mexico available for navigation by vessels of 23 feet draft.

The act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes, of June 3, 1896, contains the following:

Improving Mobile Harbor, Alabama: For maintenance of the channel by dredging, $60,000.

On December 28, 1896, contract was entered into with the National Dredging Company, of Wilmington, Del., for the hire of dredging plant, consisting of dredge *Chas. Fobes*, steam tug *Mary B. Curtis*, three scows, and coaling sloop *Captain Ben*, to be paid for at the rate of $230 per day of eight hours, the contractor guaranteeing to remove 2,875 cubic yards per day.

Work was commenced under this contract on January 27, 1897, and is being carried on June 30, 1897.

The dredge was placed at work at a point 2,223 feet south of Station 30 (the point most subject to complaint by pilots), and two cuts of 40 feet each have been redredged from that point down to 1,347 feet south of Station 36, a distance of 14,964 feet, the cuts being located 160 and 240 feet westerly to the line of stations and excavated to a depth of 23 feet at mean low water.

The dredge has removed 384,658 cubic yards of material, very soft to slightly stiff mud, mixed with a little decayed shell, and the contractor has been paid for 129⅜ working days, which, at the rate of $230 per day, amounts to $29,756.25, making the cost of material dredged 7.74 cents per cubic yard.

At the close of the fiscal year ending June 30, 1897, the following is the condition of the channel:

	Miles.
Less than 23 feet at mean low water	20
Less than 22 feet at mean low water	13
Less than 21 feet at mean low water	10
Less than 20 feet at mean low water	4¼

While the length of channel of less depth than 23 feet is large, it occurs through very soft material, through which vessels easily plow to a depth of from 2 to 3 feet, and vessels of 23 feet draft are constantly passing through it without detention.

The steamer *Maud* has removed from the channel during the year all deadheads visible.

Two maps are inclosed herewith, showing present condition of dredged channel.

The total amount expended on this improvement to June 30, 1897, is $2,183,161.32.

Tabular statement showing the channel as dredged and its condition June 30, 1897.

Locality.	Dredged.		Examinations.					
	Width.	Central depth.	Cross section at—	Distance between stations.	Top width.	Maximum depth in cross section.		
						June, 1891.	June, 1896.	June, 1897.
	Feet.	*Feet.*		*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Station 0	.....	.....	Initial point at mouth of Chickasabogue Creek.	.....	1,550	15.9	15.6	15.7
			South of initial point.					
Station 0 to 1	.....	.....	0.50 mile	2,640	950	23.0	24.5	27.1
Station 1 to 2	.....	.....	1.00 miles	2,640	750	21.3	24.3	26.7
Station 2 to 3	.....	.....	1.50 miles	2,640	800	21.3	27.8	26.2
Station 3 to 4	120	23–24	2.00 miles	2,640	1,060	18.9	25.1	26.0
Station 4 to A	120	23–24	2.03 miles	200	1,070	18.9	24.8	24.2
Station A to 5	120	23–24	2.50 miles	2,440	960	21.3	24.4	25.7
Station 5 to 6	120	23–24	3.00 miles	2,640	1,035	16.7	24.2	23.4
Station 6 to 7	160	23–24	3.50 miles	2,640	910	16.5	23.4	23.1
Station 7 to B	80	23–24	3.54 miles	240	890	17.1	23.4	23.3
Station B to 8	80	23–24	4.00 miles	2,400	720	16.4	22.3	22.7
Station 8 to C	80	23–24	4.21 miles	1,210	700	19.7	23.5	23.7

Tabular statement showing the channel as dredged and its condition June 30, 1897—Continued.

Locality.	Dredged.		Examinations.					
	Width.	Central depth.	Cross section at—	Distance between stations.	Top width.	Maximum depth in cross section.		
						June, 1891.	June, 1896.	June, 1897.
			South of initial point—Continued.					
	Feet.	*Feet.*		*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Station C to 9	80	23–24	4.50 miles	1,430	570+	21.3	27.7	25.8
Station 9 to 10	240	23–24	5.00 miles	2,640	700	19.7	27.8	25.3
Station 10 to D	240	23–24	5.04 miles	245	700	17.6	26.5	25.9
Station D to E	475	23–24	5.35 miles	1,650	700	19.6	27.0	25.8
Station E to 11	475	23–24	5.50 miles	745	700	19.9	26.1	25.7
Station 11 to F	475	23–24	5.54 miles	233	700	19.9	26.9	25.6
Station F to 12	280	23–24	6.00 miles	2,407	700	21.3	24.8	24.5
Station 12 to G	280	23–24	6.38 miles	2,034	700	18.3	27.9	26.4
Station G to 13	280	23–24	6.50 miles	606	700	18.8	27.2	25.3
Station 13 to 14	280	23–24	7.00 miles	2,640	700	24.5	24.1	23.4
Station 14 to 15	280	23–24	7.50 miles	2,640	700+	24.5	24.1	22.4
Station 15 to 16	280	23–24	8.00 miles	2,640	700+	26.3	25.1	22.7
Station 16 to H	280	23–24	8.07 miles	404	700+	26.3	24.5	22.1
Station H to I	340	23–24	8.49 miles	2,228	700+	24.8	25.0	22.5
Station I to 17	340	23–24	8.50 miles	8	700+	24.8	25.0	22.5
Station 17 to 18	280	23–24	9.00 miles	2,640	700+	21.8	25.2	21.8
Station 18 to 19	280	23–24	9.50 miles	2,640	700+	25.0	27.9	22.5
Station 19 to 20	280	23–24	10.00 miles	2,640	700+	26.3	25.2	22.6
Station 20 to 21	280	23–24	10.50 miles	2,640	700+	16.9	27.6	22.6
Station 21 to 22	280	23–24	11.00 miles	2,640	700+	16.7	24.6	21.9
Station 22 to 23	280	23–24	11.50 miles	2,640	700+	16.1	23.0	21.1
Station 23 to 24	280	23–24	12.00 miles	2,640	700+	16.5	23.0	20.8
Station 24 to 25	280	23–24	12.50 miles	2,640	700+	16.4	24.9	21.4
Station 25 to 26	280	23–24	13.00 miles	2,640	700+	16.1	23.9	20.8
Station 26 to 27	280	23–24	13.50 miles	2,640	700+	16.2	24.3	21.6
Station 27 to 28	280	23–24	14.00 miles	2,640	700+	17.9	25.8	21.6
Station 28 to 29	280	23–24	14.50 miles	2,640	700+	16.1	25.3	20.6
Station 29 to 30	280	23–24	15.00 miles	2,640	700+	16.2	24.5	21.6
Station 30 to 31	280	23–24	15.50 miles	2,640	700+	16.3	22.8	27.5
Station 31 to 32	280	23–24	16.00 miles	2,640	700+	16.5	22.9	28.8
Station 32 to 33	280	23–24	16.50 miles	2,640	700+	16.1	23.2	26.9
Station 33 to 34	280	23–24	17.00 miles	2,640	700+	16.1	23.0	27.7
Station 34 to 35	280	23–24	17.50 miles	2,640	700+	15.5	23.0	27.0
Station 35 to 36	280	23–24	18.00 miles	2,640	700+	15.7	23.4	27.6
Station 36 to 37	280	23–24	18.50 miles	2,640	700+	15.4	24.3	19.5
Station 37 to 38	280	23–24	19.00 miles	2,640	700+	15.5	23.5	20.1
Station 38 to 39	280	23–24	19.50 miles	2,640	700+	15.3	24.5	20.0
Station 39 to 40	280	23–24	20.00 miles	2,640	700+	15.4	24.5	20.4
Station 40 to J	280	23–24	20.47 miles	2,471	700+	15.0	24.0	21.0
Station J to 41	500	23–24	20.50 miles	169	700+	15.0	23.2	22.0
Station 41 to K	500	23–24	20.63 miles	671	700+	15.0	23.0	22.8
Station K to L	500	23–24	20.80 miles	918	700+	14.6	22.4	22.2
Station L to 42	280	23–24	21.00 miles	1,051	700+	14.6	25.6	25.0
Station 42 to 43	280	23–24	21.50 miles	2,640	700+	14.7	26.0	23.0
Station 43 to 44	280	23–24	22.00 miles	2,640	700+	14.3	26.0	21.9
Station 44 to 45	280	23–24	22.50 miles	2,640	700+	18.4	25.6	20.8
Station 45 to 46	280	23–24	23.00 miles	2,640	700+	22.0	27.4	20.7
Station 46 to 47	280	23–24	23.50 miles	2,640	700+	22.8	24.6	20.0
Station 47 to 48	280	23–24	24.00 miles	2,640	700+	21.5	27.6	19.5
Station 48 to 49	280	23–24	24.50 miles	2,640	700+	21.6	25.3	19.5
Station 49 to 50	280	23–24	25.00 miles	2,640	700+	21.5	23.9	19.5
Station 50 to 51	280	23–24	25.50 miles	2,640	700+	19.0	24.8	19.4
Station 51 to 52	280	23–24	26.00 miles	2,640	700+	18.0	26.0	20.0
Station 52 to 53	280	23–24	26.50 miles	2,640	700+	13.0	26.4	19.7
Station 53 to 54	280	23–24	27.00 miles	2,640	700+	13.2	23.6	19.7
Station 54 to 55	280	23–24	27.50 miles	2,640	700+	13.7	26.7	19.8
Station 55 to 56	280	23–24	28.00 miles	2,640	700+	13.7	25.3	20.3
Station 56 to 57	280	23–24	28.50 miles	2,640	700+	14.4	23.6	20.3
Station 57 to 58	280	23–24	29.00 miles	2,640	700+	14.4	21.9	20.7
Station 58 to 59	280	23–24	29.50 miles	2,640	700+	14.4	21.3	22.4
Station 59 to 60	280	23–24	30.00 miles	2,640	700+	15.3	21.6	23.0
Station 60 to 61	280	23–24	30.50 miles	2,640	700+	16.1	21.3	23.1
Station 61 to M	280	23–24	30.81 miles	1,659	700+	16.1	21.4	23.1
Station M to 62	200	23–24	31.00 miles	981	700+	16.2	22.9	23.2
Station 62 to 63	200	23–24	31.50 miles	2,640	700+	23.2	23.9	26.2
Station 63 to 64	200	23–24	32.00 miles	2,640	700+	22.3	27.9	24.9
Station 64 to 65	200	23–24	32.50 miles	2,640	350	21.0	29.4	28.6
Station 65 to 66	200	23–24	33.00 miles	2,640	370	22.9	26.8	26.8
Station 66 to N	200	23–24	33.08 miles	459	390	23.1	25.9	25.8

Money statement.

July 1, 1896, balance unexpended		$221,447.21
Amount appropriated by act of June 4, 1897		25,000.00
		246,447.21
June 30, 1897, amount expended during fiscal year		190,808.53
July 1, 1897, balance unexpended		55,638.68
July 1, 1897, outstanding liabilities	$73.10	
July 1, 1897, amount covered by uncompleted contract	28,601.37	
		28,674.47
July 1, 1897, balance available		26,964.21
Amount (estimated) required for completion of existing project (maintenance)		300,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899 (maintenance)		200,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Work was first done on the channel leading to the wharves at Mobile by the General Government in 1827.

The following appropriations were made by Congress:

May 20, 1826	$10,000.00
March 2, 1829	20,000.00
June 24, 1834	10,000.00
March 3, 1835	17,997.60
March 3, 1837	50,000.00
July 7, 1838	50,000.00
August 3, 1852	50,000.00
	207,997.60
March 3, 1857 (relief claim)	20,833.08
Total	228,830.68

The second stage of improvement was entered upon in 1870. This project was finished in 1876, under the following appropriations:

By act of Congress—	
July 11, 1870	$50,000
March 3, 1871	50,000
June 10, 1872	75,000
March 3, 1873	100,000
June 23, 1874	100,000
March 3, 1875	26,000
Total	401,000

In the third stage of improvement work was done under appropriations as follows:

June 18, 1878 (survey)	$10,000
March 3, 1879	100,000
June 14, 1880	125,000
March 3, 1881	100,000
August 2, 1882	125,000
July 5, 1884	200,000
August 6, 1886	90,000
Total	750,000

The fourth stage of this work was begun in 1888, and has been completed.

Appropriations have been made as follows:

By act of Congress—	
August 11, 1888	$250,000
September 19, 1890	350,000
July 13, 1892	212,500
Sundry civil act, March 3, 1893	500,000
Sundry civil act, August 18, 1894	390,000
Sundry civil act, March 2, 1895	291,300
March 16, 1896	160,000
June 3, 1896	60,000
June 4, 1897	25,000
Total	2,238,800

Abstract of proposals for hire of dredging plant for Mobile River and Bay, Alabama, opened December 19, 1896.

Name and address of bidder.	Hire of dredging plant per day.	To remove each day of eight hours.
		Cubic yds.
National Dredging Co., Wilmington, Del	$230	2,875
Rittenhouse Moore Dredging Co., Mobile, Ala	249	2,500

The following contract is in force: With the National Dredging Company, for hire of dredging plant, approved February 16, 1897, work beginning February 28, 1897, and to be completed when the amount available shall have been exhausted.

COMMERCIAL STATISTICS.

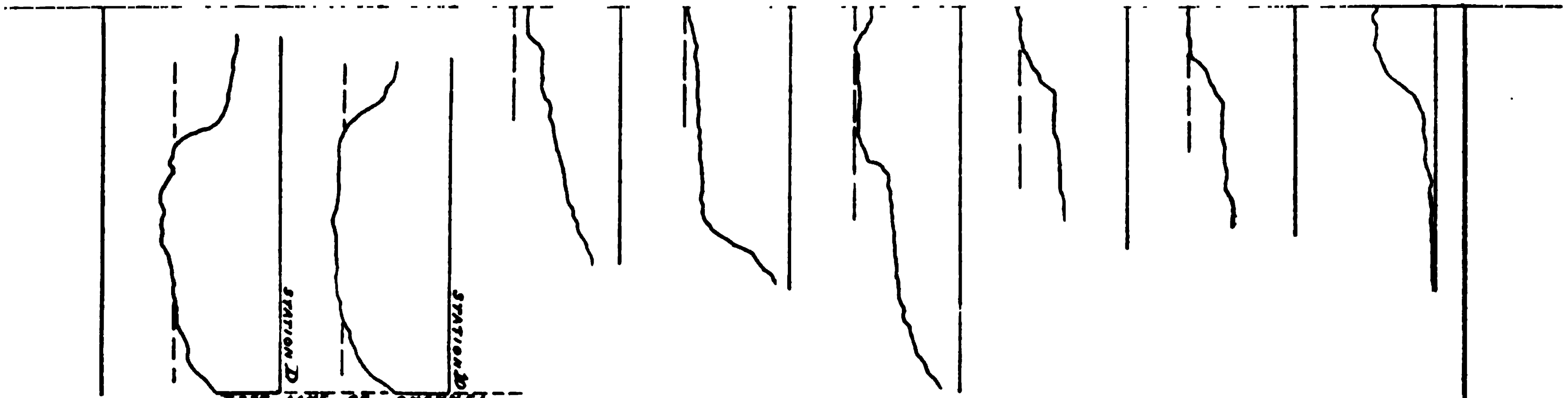
Comparative statement of lumber, cotton, etc., shipped to foreign and coastwise ports.

[Compiled from records of the Mobile Cotton Exchange.]

Articles.	1897.	1896.	1895.	1894.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Lumber	106,095	88,045	83,557	107,246
Timber	191,772	129,021	144,737	60,468
Shingles	299	185	825	2,259
Staves	167			
Cotton	76,847	52,090	29,941	9,835

Comparative statement tabulated from information furnished by the United States custom-house.

Description.	Entered.		Cleared.	
	1897.	1896.	1897.	1896.
Foreign	464	412	491	413
Domestic	49	95	30	81
Total	513	507	521	494


STATION D
STATION B

Value of exports.

Description.	1897.	1896.
Domestic	$10,116,266	$6,985,876
Foreign	15,022	10,203
Total	10,131,288	6,996,079

Receipts from all sources.

Description.	1897.	1896.
Duties on imports	$20,058.00	$19,215.43
Tonnage tax	13,218.47	11,701.76
Overtime of officers	235.00	225.00
Sale of old material	10.00	.....
Fines, penalties, and forfeitures	38.00	27.71
Miscellaneous customs receipts	965.95	929.50
Storage	169.30	125.00
Official fees	3,056.95	2,829.54
Total	37,752.27	35,053.94

Comparative statement of the number and draft of vessels passing up and down the dredged channel.

[Compiled from the records of the harbor master.]

Draft in feet.	Steamships.				Square-rigged vessels.				Schooners.				Total.			
	Up.		Down.		Up.		Down.		Up.		Down.		Up.		Down.	
	1897.	1896.	1897.	1896.	1897.	1896.	1897.	1896.	1897.	1896.	1897.	1896.	1897.	1896.	1897.	1896.
Less than 13	180	253	87	131	84	98	2	8	79	7	18	.....	343	358	107	139
13 to 14	72	16	25	32	40	30	5	1	.....	94	7	30	112	140	37	63
14 to 15	20	10	33	16	21	30	7	5	1	.....	13	39	42	46	53	60
15 to 16	8	12	19	24	11	15	4	12	.....	.....	8	20	19	27	31	56
16 to 17	7	11	9	20	6	5	14	15	.....	.....	16	5	13	16	39	40
17 to 18	1	1	14	16	3	1	12	15	.....	.....	9	.....	4	2	35	31
18 to 19	2	.....	41	38	3	.....	10	20	.....	.....	.....	.....	5	.....	51	58
19 to 20	.....	.....	8	5	.....	2	19	11	.....	.....	4	.....	.....	2	31	16
20 to 21	.....	.....	10	3	1	.....	13	23	.....	.....	1	.....	1	.....	24	26
21 to 22	.....	.....	16	6	1	.....	30	13	.....	.....	.....	.....	1	.....	46	19
22 to 23	.....	.....	17	9	.....	.....	25	34	.....	.....	.....	.....	.....	.....	42	43
23 to 23.5	.....	.....	5	3	.....	.....	15	19	.....	.....	.....	.....	.....	.....	20	22
Total	290	309	284	303	170	181	156	176	80	101	76	94	540	591	516	573

Q 2.

IMPROVEMENT OF BLACK WARRIOR RIVER, ALABAMA, FROM TUSCALOOSA TO DANIELS CREEK.

The Black Warrior River drains a large section of north Alabama, estimated at about 8,000 square miles, the head waters of the smaller streams reaching nearly to the Tennessee River.

Surveys of it have from time to time been made, the most extensive reaching to the forks of the Sipsey and Mulberry, 92¼ miles above the city of Tuscaloosa. At Tuscaloosa the name of the stream changes in the appropriation bills, that portion above the city being called the Black Warrior and that below the Warrior. The river is subject to frequent and rapid rises, and its discharge varies from about 165 cubic feet per second to more than 120,000 cubic feet per second. Along its banks are found large and valuable deposits of coal, and the river bottoms are rich agricultural lands. It has never been navigable except

at very high stages, owing to the Tuscaloosa Shoals, where there is a fall of more than 30 feet in less than 2 miles. The desire to get the products of the coal mines to tide water was the great cause of the improvement undertaken, and on January 12, 1896, the first tow of coal passed down, reaching tide water at Mobile on January 30, 1896. This small tow (one barge) was the subject of town meetings and an ovation at each town as it passed. It was looked upon as the first visible sign of what it is hoped and believed will be the source of prosperity to this section.

An act of May 23, 1828, declared the Black Warrior River, Alabama, free from all tolls, except such as might be allowed by act of Congress (sec. 5244, Rev. Stat., ed. of 1878, p. 1015).

The following examinations and surveys have been made:

1. An examination and partial survey of the river from Locust Fork to Tuscaloosa, 47½ miles, in 1874. (See Report of Chief of Engineers, 1875.)

2. A survey of the river from Tuscaloosa to the forks of Sipsey and Mulberry in 1879. (See Report of Chief of Engineers, 1881.)

3. A survey of the river from Tuscaloosa to the Mulberry and Locust forks, a distance of 47½ miles, in 1895. (Published in House Ex. Doc. No. 259, Fifty-fourth Congress, first session.)

All plans and projects for the improvement of this river have contemplated the use of locks and dams.

After the first appropriation, by act of July 5, 1884, was made, which provided that the improvement should extend from Tuscaloosa to Daniels Creek, a distance of 15 miles, a project was proposed. This project proposed the use of locks with movable dams and was submitted December 19, 1885. The plans were submitted to a Board of Engineer Officers which met in Tuscaloosa February 10, 1886. This Board modified the project and recommended fixed dams with increased lift. New plans and estimates were submitted August 13, 1886, and were finally approved by the Board with slight modifications in their report of April 2, 1887. This report received the approval of the Chief of Engineers May 19, 1887.

The approved project was to construct five locks and fixed dams with a total lift of 52 feet. The locks were to be 52 feet clear width, 322 feet long between hollow quoins, available length 285 feet, and to have a depth of 6½ feet on miter sills. The locks were to be built with iron gates and of rock found in the vicinity. The dams were to be of the rock-fill type. The estimated cost, on the basis of ten hours for a day's labor, was $741,640. This will have to be increased, as a day's labor is now by law eight hours.

Work was begun in March, 1888, and has been carried on continuously since with the exception of a suspension from September 1 to October 20, 1890, caused by exhaustion of funds.

At this time three locks and dams have been completed and are now being used commercially. A small shoal below the first lock has been partially removed to the depth required to give 6 feet depth when the locks and dams are built on the lower river.

The rock used in the construction of Lock No. 1 was obtained from a quarry on shore, but for Locks Nos. 2 and 3 the rock was taken from the bed of the river. This last bed was uncovered by the cofferdam of Lock No. 3, and was found of superior quality.

The site for Lock No. 4 has been purchased, and that for the site of the abutment is now being negotiated for. A quarry of suitable stone

for the building has been located and the stone examined. The site for lock house and yard for stonecutting, storehouses, etc., has been leveled.

Money statement.

July 1, 1896, balance unexpended	$28,870.98
June 30, 1897, amount expended during fiscal year	8,868.74
July 1, 1897, balance unexpended	20,002.24
July 1, 1897, outstanding liabilities	84.88
July 1, 1897, balance available	19,917.36
Amount (estimated) required for completion of existing project	190,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	190,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

The following appropriations have been made:

By act of—	
July 5, 1884	$50,000
August 5, 1886	56,250
August 11, 1888	100,000
September 19, 1890	150,000
July 13, 1892	200,000
August 18, 1894	37,500
June 3, 1896	10,000
Total	603,750

I append the report of Assistant Engineer R. C. McCalla, jr.

REPORT OF R. C. M'CALLA, JR., ASSISTANT ENGINEER.

TUSCALOOSA, ALA., *July 1, 1897.*

MAJOR: I have the honor to report the following operations on Black Warrior River improvement during fiscal year ending June 30, 1897:

GENERAL CHARACTERISTICS.

The term "Black Warrior River," in the appropriation bills, is applied to all that portion of the stream extending above the city of Tuscaloosa to its head waters in northern Alabama. Forty-seven and one-half miles above Tuscaloosa the Mulberry and Locust forks come together to form the main river. These streams are known locally as Big Warrior and Little Warrior, respectively. Ninety-two and one-half miles above Tuscaloosa the Sipsey Fork joins the Mulberry Fork. Other tributaries are small. All of these streams flow through narrow valleys inclosed by steep hills and perpendicular rock bluffs. They have a rapid fall and are composed at low water of a series of pools, connected at frequent intervals by wide, shallow, rock rapids, where the falls are concentrated. The most serious impediment to improvement is Squaw Shoals, on the main river, about 25 miles above Tuscaloosa, where there is a full fall of about 41 feet in less than 4½ miles.

These streams split the great Warrior coal basin in twain and have long been regarded by the people of this section as the ultimate highway for the minerals and manufactures of Alabama to the sea. Violent floods occur during the winter and spring, which run off very quickly, carrying with them immense quantities of drift-wood. The only practicable method of improving this section of the river is by means of locks and dams.

PREVIOUS IMPROVEMENT.

The project for improving the Black Warrior River above Tuscaloosa, as adopted by Congress, contemplates the opening of the river for a distance of 15 miles only, from Tuscaloosa to the mouth of Daniels Creek, by means of locks and dams affording 6 feet navigable depth throughout the year, and a total lift of 52 feet.

On April 23, 1888, proposals for the construction of Lock No. 1 were opened. These were rejected as being too high, and authority was obtained for prosecuting the improvement by means of hired labor and the purchase of materials and supplies by contract as far as possible. Under this system work was begun in May, 1888. Three locks and dams were built, with a total lift of 33 feet, overcoming the falls at Tuscaloosa and giving slack-water navigation into the lower edge of the Warrior coal fields, thus moving the head of navigation 9 miles upstream.

These locks were opened for traffic in November, 1895, and since July 1, 1896, have been operated and maintained under the general law, having cost a total of about $575,000, including surveys, channel work between locks, Mobile office expenses, and other items. On July 1, 1896, the total of appropriations for this improvement amounted to $603,750, and it was estimated that the project could be completed by a further appropriation of $190,500.

The total cost of the locks and dams proper, not including Mobile office expenses, amounted to $541,215.57, and may be itemized as follows:

Lock and Abutment No. 1.

[Lock masonry, 9,762 cubic yards; abutment masonry, 825 cubic yards.]

Item.	Quantity.	Cost.	Rate per unit.
Stone quarried ..... cubic yards	10,087	$34,400.96	$3.410+
Stone cut ..... do	3,530	37,637.27	10.662+
Masonry laid, including cement ..... do	10,087	25,474.07	2.525+
Earth excavation ..... do	10,809	3,016.99	.279+
Rock excavation ..... do	8,778	5,014.38	1.337+
Earth filling ..... do	4,500	1,145.65	.254+
Rock filling ..... do	2,500	1,238.98	.495+
Paving, 12 inches thick ..... square yards	6,774	.....	.....
Turfing ..... do	3,132	2,199.52	.222+
Gates and valves	.....	12,010.50	.....
Cofferdam and pumping	.....	8,555.54	.....
Handling and hauling	.....	20,273.22	.....
Boats and buildings	.....	4,518.44	.....
Track and roads	.....	10,882.29	.....
Tools and plant	.....	28,535.18	.....
Engineering and superintendence	.....	19,404.90	.....
Incidentals	.....	6,771.01	.....
Total	.....	221,078.90	.....

Dam No. 1.

[Dam 10 feet high, 339 feet long, and 21 feet width of base.]

Lumber and iron ..... feet B. M.	36,238	$1,010.65	$27.889+
Carpenter work ..... do	36,238	336 30	9.289+
Stone quarried ..... cubic yards	1,467	5,003.09	3.410+
Stone, rough dressed ..... do	360	1,059.41	2.942+
Masonry laid, dry rubble ..... do	1,467	1,243.11	.847+
Earth excavation ..... do	329	60.04	.182+
Filling above dam ..... do	502	425.00	.846+
Handling and hauling	.....	465.22	.....
Track and roads	.....	100.13	.....
Engineering and superintendence	.....	477.04	.....
Incidentals	.....	143.73	.....
Total	.....	10,878.62	.....

Guide Crib No. 1.

[Guide crib 29 feet 10 inches high, 90 feet long, and 11 feet 8 inches wide.]

Lumber and iron ..... feet B. M.	34,453	$470.40	$13.653+
Carpenter work ..... do	34,453	239.07	6.939+
Filling rock ..... cubic yards	1,640	567.51	.346+
Total	.....	1,276.98	.....

Lock and Abutment No. 2.

[Lock masonry, 10,723 cubic yards; abutment masonry, 559 cubic yards.]

Item.	Quantity.	Cost.	Rate per unit.
Stone quarried.....cubic yards..	11,282	$16,509.14	$1.463+
Stone cut.....do....	3,595	25,744.53	7.161+
Masonry laid, including cement.....do....	11,282	21,330.53	1.890+
Earth excavation.....do....	6,876	1,636.01	.237+
Rock excavation.....do....	941	995.57	1.057+
Earth filling.....do....	6,552	1,351.86	.206+
Paving, 12 inches thick.....square yards..	8,367	.....	.....
Turfing.....do....	1,021	2,099.52	.217+
Gates and valves.....	.....	9,698.45	.....
Cofferdam and pumping.....	.....	2,402.10	.....
Handling and hauling.....	.....	10,002.62	.....
Boats and buildings.....	.....	3,441.87	.....
Track and roads.....	.....	9,867.23	.....
Tools and plant.....	.....	22,512.68	.....
Engineering and superintendence.....	.....	13,841.16	.....
Incidentals.....	.....	5,507.40	.....
Total.....	.....	146,880.67	.....

Dam No. 2.

[Dam 13 feet high, 410 feet long, and 24 feet width of base.]

Lumber and iron.....feet B. M..	53,556	$850.91	$15.888+
Carpenter work.....do....	53,556	381.80	7.128+
Stone quarried.....cubic yards..	3,646	3,350.85	.919+
Stone, rough dressed.....do....	373	631.37	1.692+
Masonry laid, dry rubble.....do....	3,646	1,868.20	.512+
Earth excavation.....do....	360	45.85	.127+
Filling above dam.....do....	607	401.99	.662+
Cement.....	.....	135.00	.....
Handling and hauling.....	.....	586.54	.....
Track and roads.....	.....	106.48	.....
Tools and plant.....	.....	904.03	.....
Engineering and superintendence.....	.....	1,081.62	.....
Incidentals.....	.....	497.61	.....
Total.....	.....	10,902.25	.....

Guide Crib No. 2.

[Guide crib 28 feet 8 inches high, 90 feet long, and 11 feet 6 inches wide.]

Lumber and iron.....feet B. M..	33,109	$419.80	$12.679+
Carpenter work.....do....	33,109	226.17	6.831+
Filling rock.....cubic yards..	1,105	263.88	.238+
Total.....	.....	909.85	.....

Lock and Abutment No. 3.

[Lock masonry, 10,885 cubic yards; abutment masonry, 530 cubic yards.]

Item.	Quantity.	Cost.	Rate per unit.
Stone quarried.....cubic yards..	11,415	$18,923.33	$1.657+
Stone cut.....do....	3,997	24,057.88	6.018+
Masonry laid, including cement.....do....	11,415	20,691.09	1.812+
Earth excavation.....do....	3,529	910.35	.257+
Rock excavation.....do....	2,500	2,501.68	1.000+
Earth filling.....do....	7,496	2,156.41	.287+
Paving, 12 inches thick.....square yards..	7,036	966.43	.137+
Gates and valves.....	.....	9,919.30	.....
Handling and hauling.....	.....	8,510.01	.....
Boats and buildings.....	.....	3,445.21	.....
Track and roads.....	.....	2,022.80	.....
Tools and plant.....	.....	17,852.08	.....
Engineering and superintendence.....	.....	18,892.26	.....
Incidentals.....	.....	5,712.64	.....
Total.....	.....	131,561.47	.....

Dam No. 3.

[Dam 15 feet high, 650 feet long, and 26 feet width of base.]

Lumber and iron....feet B. M..	93,759	$1,274.55	$13.593+
Carpenter work....do....	93,759	089.77	7.356+
Stone quarried....cubic yards..	6,130	4,153.50	.677+
Stone, rough dressed....do....	893	1,403.10	1.171+
Masonry laid, dry rubble....do....	6,130	1,916.10	.312+
Filling above dam....do....	1,444	868.85	.601+
Cement....	.....	135.00	.....
Handling and hauling....	.....	1,168.34	.....
Track and roads....	.....	635.48	.....
Tools and plant....	.....	2,668.77	.....
Engineering and superintendence....	.....	1,278.22	.....
Incidentals....	.....	145.15	.....
Total....	.....	16,336.83	.....

Guide Crib No. 3.

[Guide crib 28 feet 8 inches high, 90 feet long, and 11 feet 6 inches wide.]

Lumber and iron....feet B. M..	33,109	$468.97	$14.164+
Carpenter work....do....	33,109	417.95	12.623+
Filling rock....cubic yards..	1,090	503.58	.462+
Total....	.....	1,390.50	.....

SUMMARY.

Cost of Lock No. 1....	$233,234.50
Cost of Lock No. 2....	158,692.27
Cost of Lock No. 3....	149,288.80
Total....	541,215.57

Lock No. 3 was built last, and is a considerable improvement on the other two locks as to quality of masonry and general workmanship. This lock also contains more masonry and the dam is much larger and longer than the others, yet they were built for less money than the other locks and dams. This is due, I think, to very favorable conditions and rapid prosecution of the work. The masonry was begun on June 15, 1893, and the lock walls proper were finished on November 8, 1893. The entire masonry of the lock was completed ready for the gates and valves on December 26, 1893.

Analyzing the cost of lock and abutment No. 3 gives percentages as follows:

	Cost.	Per cent.
Earth excavation....	$910.35	0.7
Paving....	966.43	.7
Track and roads....	2,022.80	1.5
Earth filling....	2,156.41	1.6
Rock excavation....	2,501.68	1.9
Boats and buildings....	3,445.21	2.6
Incidentals....	5,712.64	4.4
Handling and hauling....	8,510.01	6.5
Gates and valves....	9,919.30	7.4
Engineering and superintendence....	13,892.26	10.6
Tools and plant....	17,852.08	13.6
Quarrying....	18,923.33	14.4
Cement and laying stone....	20,691.09	15.8
Stonecutting....	24,057.88	18.3
Total....	131,561.47	100

Deducting the following items, which do not properly enter into the cost:

Earth excavation....	$910.35
Rock excavation....	2,501.68
Earth filling....	2,156.41
Paving....	966.43
Gates and valves....	9,919.30
Lock tender's house....	1,705.76
	18,159.93

leaves a total cost for first-class masonry proper as follows: 11,415 cubic yards $113,401.54, or $9.934+ per cubic yard.

Analyzing cost of Dam No. 3, gives percentages as follows:

	Cost.	Per cent.
Cement	$135.00	.8
Incidentals	145.15	.9
Track and roads	635.48	3.9
Carpenter work	689.77	4.2
Filling above dam	868.35	5.3
Handling and hauling	1,168.34	7.2
Lumber and iron	1,274.55	7.8
Engineering and superintendence	1,278.22	7.9
Dressing stone	1.403.10	8.6
Laying stone	1,916.10	11.7
Tools and plant	2,668.77	16.3
Quarrying	4,153.50	25.4
Total	16,336.83	100

Deducting the following items, which do not properly enter into the cost of masonry:

Lumber and iron	$1,274.55
Carpenter work	689.77
Filling above dam	868.85
Cement	135.00
	2,968.17

leaves a cost for dry rubble dam masonry proper as follows: 6,130 cubic yards, $13,368.66, or $2.180+ per cubic yard.

No expense is charged against Lock No. 3 for cofferdam and pumping, because the lockpit was self-draining during construction, and the cofferdam, which was simply a deflecting dike, had been previously built to protect the river quarry and was charged to the cost of quarrying stone. It will be noticed in the tables of cost of the three locks that stonecutting is the most costly item of construction. Masonry, tools and plant, and quarrying come next. It is thought that in building future locks the cost of stonecutting can be much reduced by purchasing and operating a stone sawing plant.

The bulk of the stone used in building these locks and dams was obtained from a quarry in the bed of the river below Lock No. 3. About 7 acres of the river bed, including the site of Lock No. 3, were exposed by a wing dam and training wall. Tracks were laid on an incline down the river bank into this space, and an excellent quality of light-gray sandstone was quarried from an area of several acres to a depth of 12 to 18 feet. Seepage water was controlled by two 3-inch pulsometers, and quarrying was confined to the low-water season, the excavation being pumped out after each flood.

There was no stripping, and the total cost of quarrying was about $1.35 per cubic yard.

During 1895 a thorough survey of the river was made, at a cost of $2,354.36, from the mouth of Daniels Creek, 15 miles above Tuscaloosa, to the confluence of the Mulberry and Locust forks, 47½ miles above Tuscaloosa; and it was estimated that eight locks and dams, at a total cost of $1,750,000, would be required to afford a navigable depth of 6 feet throughout the year on this portion of the river. This latter project has not yet been adopted by Congress.

NAVIGATION AND COMMERCE.

The Tuscaloosa locks were opened for traffic on November 18, 1895, and the first commercial use of them was made on November 23, 1895, by the passing down through Locks Nos. 2 and 3 of a 40-ton barge of coal, from the Tide Water mine for the Tuscaloosa market. Since that time the market price of coal in Tuscaloosa has been reduced from 30 to 50 per cent by the traffic through these locks.

Navigation is confined entirely to the improved portion of the river, 9 miles in length. The pool above Lock No. 3 is 7 miles long, 500 to 700 feet wide, has a minimum depth of 7½ feet at low water, and affords storage room for an unlimited number of barges. Three coal mines and a large sawmill are developing upon this portion of the river as a direct result of the building of the locks. Excellent long-leaf pine, suitable for building barges, is found in large quantities near the river and is now being rafted down to the mill above Lock No. 3.

The mines are sufficiently developed for an aggregate output of at least 300 tons per

day and are dependent entirely upon the river for transportation. Two towing companies are preparing to handle this business to Mobile next season, and I think the prospect is fair for considerable coal traffic through the locks next winter. The coal is of a quality that compares favorably with many other Alabama coals. The mill is dependent entirely upon the river for logs, but is putting in a railroad track and will ship lumber by rail or river. Its capacity is to be 40,000 feet B. M. per day, and it will cut long lengths suitable for barge building. The most suitable size for coal barges on this river is probably 24 feet beam by 140 feet long and 7 feet deep, with a capacity of about 500 tons on 6-foot draft. Four such barges could be passed through the locks at one lockage, 6 could probably be handled between Tuscaloosa and Demopolis on a fair stage of water, and 15 to 20 might be handled in one tow below Demopolis when the drawbridges are remodeled.

RECENT OPERATIONS.

On October 1, 1896, Mr. P. C. Boudousquie began getting up, under my direction, a complete set of plans of Locks Nos. 1, 2, and 3, and he has worked very faithfully since that time. Ten sheets showing Lock No. 1, with details complete; two sheets of Lock No. 2, showing plan and cross sections of lock walls, and two similar sheets of Lock No. 3 will be ready for publication in time for the Annual Report. This work was rendered necessary by a number of departures during construction from the original plans, no perfect record of which were on file.

Two acres for the site of Lock No. 4, on the east bank of the river, 9 miles above Tuscaloosa, have been purchased from the Tide Water Coal Company, at a cost of $60. Negotiations are pending with the Blair Coal Company for the purchase of $4\frac{15}{100}$ acres on the opposite bank for the site of the abutment, but have not yet been concluded.

During the month of February, 1897, the country surrounding the site of Lock No. 4 was thoroughly prospected for a quarry, which was finally located on the bank of the river, 1,700 feet above the lock site. Here is found, in vast quantity, a most excellent quality of light-blue sandstone that will make very handsome masonry. The stone lies in four ledges, aggregating about 40 feet in thickness. It rifts and works well, can be quarried very cheaply, and the stripping above it is quite moderate. A number of locks can be built from this quarry. A track can be laid to Lock No. 4, and for other locks the stone can be loaded direct from the quarry on barges and thus transported cheaply. A number of 6-inch specimen cubes of this stone have been prepared, the six faces being dressed in different manners, and are now at this office.

During March, April, May, and a few days of June, 1897, a pathway, which will eventually be widened for tracks, was graded from the quarry to the lock site, and a yard 5 feet above high water was graded at the lock site for the lock tender's house and construction houses. This work was all done by one overseer and a small force of laborers, and may be itemized as follows:

	Cubic yards.
Earth excavation:	
Prospecting for quarry	760
For pathway	170
For lock yard	4,623
Rock excavation:	
For lock yard	1,257

On June 5, 1897, all work at Lock No. 4 was abandoned indefinitely, as the force there employed was needed for channel work at Tuscaloosa, and the funds available were entirely inadequate for beginning the construction of a lock. A gauge at Lock No. 4 has been read daily at 7 a. m. since February 1, 1897, and this will be continued.

FINAL REMARKS.

On February 4, 1897, the chairman and four other members of the Committee on Rivers and Harbors of the House of Representatives inspected the improved portion of the river and the coal mines developing thereon. They expressed themselves as greatly pleased with what they saw and stated that they considered the project one of great worthiness and great future importance. They expressed themselves as being in favor of pushing the general scheme, especially that portion below Tuscaloosa, rapidly to completion.

Very respectfully, your obedient servant,

R. C. McCALLA, Jr., *Assistant Engineer.*

Maj. WILLIAM T. ROSSELL,
Corps of Engineers, U. S. A.

Q 3.

OPERATING AND CARE OF LOCKS AND DAMS ON BLACK WARRIOR RIVER, ALABAMA.

OPERATION.

A lock master, three lock hands, and three assistant lock hands were appointed and installed on July 1, 1896, and since that date the locks have been operated and maintained under the general law.

But one accidental interruption to traffic occurred during the year, the steamer *Ottawa* being detained in Lock No. 1 twenty-one hours, from 5 p. m. March 31, to 2 p. m. April 1, 1897, owing to inability to close one of the lower gates, due to mud deposited against miter sill during a protracted flood. The mud was finally scraped away sufficiently to close the gate, and the steamer was then locked through.

During October, 1896, the pool above Lock No. 3, 7 miles long, was lowered in response to a petition of mine owners and others interested, who wished to do certain work about their tipples, which could not well be done under water. The lowering of the pool was begun on October 3, 1896, by erecting Lock No. 3 needle dam, lashing all the gates open, then regulating a gap in needle dam so as to lower the pool gradually. The pool was lowered a total of 5½ feet by October 9, 1896, and allowed to remain so until October 17, 1896, when needle dam was again erected, and the pool began refilling. On October 21, 1896, Lock No. 3 was reopened for traffic. The pool rose slowly until November 1, 1896, when the water began running over crest of dam.

MAINTENANCE.

During July, 1896, the house, outhouses, and fence at Lock No. 1, which were 8 years old, were thoroughly repaired and repainted. A well for drinking water was dug, curbed, and covered with a shed at Lock No. 3, there being no spring water near enough. At Locks Nos. 1 and 2 spring water is available.

Six curtain valves, which had been in use about two years at Lock No. 1, became unserviceable from wear. The original mats were one-fourth of an inch thick. One was of sheet rubber and the other five were of asbestos rubber cloth. The rubber mat was in much worse condition than any of the others, and the valves were repaired by substituting for the old mats new ones of asbestos rubber cloth one-half inch thick. Six duplicate valves were built and substituted for the repaired ones, which were stored away to be used in case of an emergency. The new valves operate nicely and are very tight. They were completed, and the last one hung in place during December, 1896. No serious trouble has occurred so far with the cast-iron balanced valves.

During the spring floods of 1896 two small breaches were made in the downstream face of Dam No. 3, by saw logs, which were caught and held several days by the severe "back lash," and acted as battering rams against the structure.

It was decided to overhaul and repair all the dams, and fasten the downstream face stones together with dowel pins. This work was begun on September 8, 1896, and completed on December 16, 1896, a derrick boat, steam derrick, steam drill, 20-horsepower boiler, and boiler barge being used for the purpose.

Repairs to Dam No. 1 consisted of replacing all loose stones, drilling 774 holes, and putting in 774 dowel pins, 1¼ to 1½ inches in diameter and

18 to 30 inches long, and hammering off the top corner of face stones, so that they present a round instead of a square corner to the blows of drift.

Repairs to Dam No. 2 consisted of replacing all loose stones, drilling 851 holes, and putting in 851 dowel pins, 1¼ inches in diameter and 18 to 24 inches long, and hammering off the top corners of face stones.

Repairs to Dam No. 3 consisted of tearing out and thoroughly rebuilding both breaches, replacing all loose stones, drilling 1,570 holes. and putting in 1,570 dowel pins, 1¼ inches in diameter and 18 to 24 inches long, and hammering off the top corners of the face stones.

There are two of the dowel pins in each face stone, one near each end of the stone. The pins are generally a driving fit for the holes, are driven through the top stones, and reach 9 inches into the stone underneath; so that each stone is secured by four pins, two from above in the back of the stone, and two through the front of the stone into those underneath. It will be difficult for individual stones to move now without all going together, and the dams are thought to be safe under all ordinary conditions.

During December, 1896, the needle dams at Locks Nos. 1 and 2 were erected, upper bays emptied, and upper valves overhauled. This left the locks, valves, and dams in excellent condition for the winter traffic, repairs of all kinds being completed.

The leakage under all of these dams was about 150 cubic feet per second, as determined by a careful gauging of the stream below the dams on September 15, 1896. The Tuscaloosa gauge read —0.60, the gauging gave a discharge of 164 cubic feet per second, and the quantities running over the crests of the dams were estimated at from 11 to 13 cubic feet per second. It may be necessary to put additional filling above the dams in order to reduce this leakage.

FLOODS.

A rapid rise occurred on March 6, 1897, the most rapid that has occurred since the dams were built. At 7 a. m. the Tuscaloosa gauge read 16.33. The river rose about 2 feet per hour for ten hours, then tapered off, the gauge reading 51.42 at 7 a. m. March 7, 1897, and reaching a maximum of 54.77 at 7 a. m. March 8, 1897. This is 8.63 below extreme high water of April, 1892.

The river remained at flood stages seventeen days. Lock No. 1 was submerged twenty-one days, Lock No. 2 seventeen days, and Lock No. 3 five days. Just as the locks became submerged, the fall over Dam No. 1 was 1.14 feet, river rising about 2 feet per hour; over Dam No. 2 about 2.10 feet, river rising about 2 feet per hour, and over Dam No. 3 about 1.40 feet per hour, river rising about 1 foot per hour. As the locks emerged on falling river, the fall over Dams Nos. 1, 2, and 3 was 0.10, 0.15, and 0.20 foot, respectively.

I think this proves that the guard walls of these locks, especially Lock No. 2, are none too high. The rise of April, 1892, was very rapid, about 4½ feet per hour for four hours, then tapered off. Should such a rise occur again, I think there would be between 3 and 4 feet fall over Dam No. 2 when the lock walls went under, and this would give the present riprap bank protection a severe test.

On every rise there is, up to a certain stage at each dam, a diving motion of the water, which holds drift for hours and subjects the dams to heavy blows therefrom. When the river reaches a certain stage,

depending on the rate of rise, a change occurs, the water begins to roll off in big waves, drift immediately passes off, and all danger to the dams therefrom is over. A similar reverse change occurs on falling river, but drift never moves in quantities on falling river.

A slight slip occurred in the riprap bank protection below Abutment No. 3, which should be repaired during the summer. Slight difficulty at Lock No. 3, and considerable difficulty at Lock No. 1, was met with in getting the lower gates to operate freely, owing to mud deposited during the rise. No other damage resulted from flood.

Itemized statement of expenditures during the fiscal year ending June 30, 1897.

Date.	To whom paid.	For what paid.	Amount.
1896.			
Aug. 6	Sundry persons	Pay roll for July	$34.56
6	do	do	332.15
6	Allen & Jemison Co	Hardware, etc	1.36
Sept. 5	Sundry persons	Pay roll for August	339.75
Oct. 8	do	Pay roll for September	360.25
Nov. 9	do	Pay roll for October	213.63
9	do	do	444.53
9	Allen & Jemison Co	Hardware	933.70
Dec. 11	Sundry persons	Pay roll for November	570.78
1897.			
Jan. 12	Sundry persons	Pay roll for December, 1896	404.59
Feb. 8	do	Pay roll for January, 1897	309.09
Mar. 4	do	Pay roll for February	305.00
4	J. Snow Hardware Co	Hardware	1.00
4	Allen & Jemison Co	do	57.22
Apr. 9	Sundry persons	Pay roll for March	339.37
May 10	do	Pay roll for April	285.95
June 7	do	Pay roll for May	305.00
30	do	Pay roll for June	326.50
	Total		5,564.43

Money statement.

Amount allotted by letter of Chief of Engineers, dated May 11, 1896	$4,160.00
Amount allotted by letter of Chief of Engineers, dated October 28, 1896	1,125.00
Amount allotted by letter of Chief of Engineers, dated March 15, 1897	550.00
	5,835.00
June 30, 1897, amount expended during fiscal year	5,564.43
July 1, 1897, balance unexpended	270.57

COMMERCIAL STATISTICS.

TRAFFIC.

Vessels.	Ascending.	Descending.	Total.
Government boats	6	7	13
Government barges	22	38	60
Government small craft	84	89	173
Coal barges	119	137	256
Other barges	50	43	93
Small craft	102	111	213
Tows	243	245	488
Rafts	.....	16	16
Total	626	686	1,312
Passengers	1,195	1,196	2,391
Lockages	594	633	1,227

Commercial statistics—Continued.

COMMERCE.

Date.	Coal.	Lumber.	Logs.	Merchandise.
1896.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
July	87	14	.....	0.05
August	512	15	.....	.....
September	125	.....	.....	.....
October	398	.7	.....	1.5
November	597	.....	.....	2.25
December	218	6	.....	6.25
1897.				
January	212	4	26	2.75
February	641	24	.....	6
March	36	4.8	.....	6.5
April	1,028	14.3	5	4.5
May	791	15	40	4
June	113	17	3	13.75
Total	4,758	100	74	47.55

Q 4.

IMPROVEMENT OF WARRIOR AND TOMBIGBEE RIVERS, ALABAMA AND MISSISSIPPI.

This system of rivers forms the highway for the coal, etc., coming down the Black Warrior River, as well as the natural communication for western Alabama and eastern Mississippi that lies contiguous to the upper Tombigbee.

The work done on this system is divided into sections, as follows:

(*a*) Warrior River, from the mouth to Tuscaloosa, a distance of 130 miles.

(*b*) Tombigbee River, from mouth to Demopolis, a distance of 191 miles.

(*c*) Tombigbee River, from Demopolis, Ala., to Columbus, Miss., a distance of 156 miles.

(*d*) Tombigbee River, from Columbus to Fulton, a distance of 144 miles.

(*e*) Tombigbee River, from Fulton to Walkers Bridge, a distance of 24¾ miles.

The approved project on sections *a*, *b*, and *c* propose the use of locks and dams; on *d* and *e* only snagging and temporary work in the way of dikes, etc.

To keep up navigation on these rivers it will be necessary to keep up the removal of snags, drift, etc., which accumulate annually; also to do some dredging and removal of sand, gravel, etc.

As the estimates for these improvements are only for building locks and dams, it follows that the yearly expenditures for snagging, etc., reduce the amount necessary to complete the improvement as shown on paper, but really this amount is not reduced. I respectfully recommend that the appropriations hereafter be asked for separately for the operation of snag boats and parties engaged in bank work, dike work, and removing accumulations of sand, gravel, etc.

On sections *a*, *b*, and *c* there will be necessary, annually, $45,000.

(*a*) WARRIOR RIVER, ALABAMA.

This stretch river of 130 miles long forms the second link in the chain from the Warrior Coal Fields to tide water at Mobile, Ala. The first survey of this river with a view to its improvement was made in 1874.

This stretch of river is subject to many and rapid rises, the difference between the high and low water at Demopolis being 60 feet.

It has been navigable on 10-foot rises and generally through the winter and spring. During the lower stages of summer and fall the river is not as a rule navigable.

With the small low-water discharge it was impossible to improve navigation for all stages. The boating season has an average duration of five months. During this season the depths range from 10 to 40 feet, and navigation is for the most part unobstructed; the greatest trouble is found from the sharp bends. The width was obstructed by overhanging trees. Below a 10-foot stage snags are troublesome and dangerous, and below 5-foot stage navigation practically ceases. This was the condition of the river when the survey of 1874 was made.

The first appropriation made by Congress for this river was by act of March 3, 1875. Under this appropriation a project was prepared and approved as follows:

To deepen the bars by jetty construction, remove snags, and cut down overhanging trees, to obtain for small boats a low-water channel 80 feet wide by 4 feet deep, at an estimated cost of $151,103.

The execution of the project was begun in June, 1875, and continued for an average annual period of four months to December 10, 1885, and for three months in 1887, the work being chiefly confined to the removal of snags and overhanging trees. Jetties were built to deepen the water over the bars at 49 places. They resulted in an increase of depth of 1 to 1½ feet. These works were of temporary construction and in some cases were lost by bank erosion.

On December 24, 1889, a project for improving this river by dams and pneumatic gates was submitted. This project was in the line of giving slack-water navigation throughout the year from the coal fields to Mobile. The estimated cost was $577,000, of which $399,000 was for the dams and pneumatic gates. Later it was proposed to substitute for dams and pneumatic gates an improvement by locks and dams similar in construction to those now built on the Black Warrior River.

The fall for this distance was found to be 60.2 feet. I am therefore of the opinion that 6 locks and dams will be needed. The cost of this improvement must be increased as follows:

Six locks and dams, at $200,000	$1,200,000
Contingencies, engineering expenses, etc	120,000
Total	1,320,000

In view of the fact that coal is now being brought down from above Tuscaloosa the improvement by snagging and regulating has become much more important and the work now being done is with a view of accommodating coal tows when the river is at about a 10-foot stage.

A surveying party has been organized, which will go over this stretch of river, beginning July 1, 1897. They will make such careful examinations as will enable me to locate the locks and dams necessary for the improvement.

During the fiscal year ending June 30, 1897, work continued on the channel at and just below the county bridge at Tuscaloosa. At Eddin's Cut-off and Buzzards Bar the channel has been dredged by scrapers and secondary channel closed.

Sketches of the work done at Eddin's Cut-off and Buzzards Bar are inclosed.

The following is a statement of work performed up to June 30, 1896:

Snags and stumps removed		22,045
Sunken logs removed		500
Logs on banks cut up		1,339
Trees trimmed, deadened, felled, and cut up		18,168
"Slip-ins" removed		980
Overhanging trees cut		3,167
Drift piles removed		33
Rock removed	cubic yards	5,362
Gravel removed	do	37,609
Earth excavated	do	2,500
Masonry removed from Forrest piers	do	2,527
Revetment of caving banks laid	square yards	6,491
Dams, dikes, and jetties built	linear feet	3,106
Jetties repaired	do	304
Shore protection	do	150

The total amount expended on this improvement up to June 30, 1897, is $181,516.80.

Money statement.

July 1, 1896, balance unexpended	$88,107.10
June 30, 1897, amount expended during fiscal year	39,623.90
July 1, 1897, balance unexpended	48,483.20
July 1, 1897, outstanding liabilities	1,583.95
July 1, 1897, balance available	46,899.25
Amount (estimated) required for completion of existing project	*1,320,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	500,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Appropriations were made as follows:

Warrior and Tombigbee rivers:		
March 3, 1875	$25,000	
August 14, 1876	15,000	
June 18, 1878	28,000	
March 3, 1879	20,000	
Warrior River:		
June 14, 1880	20,000	
March 3, 1881	10,622	
August 2, 1882	10,000	
July 5, 1884	12,000	
August 5, 1886	18,750	
August 11, 1888	18,000	
		$177,372

The following appropriations have been made by Congress:

September 19, 1890	$45,000	
July 13, 1892	75,000	
August 18, 1894	40,000	
June 3, 1896	70,000	
		230,000
		407,372

*New estimate furnished by authority of letter from Chief of Engineers, dated August 7, 1896.

COMMERCIAL STATISTICS.

Articles.	1897.	1896.	1895.
	Tons.	*Tons.*	*Tons.*
Cotton	2,080	1,250	1,125
Grain	2,100	1,300	1,300
Iron	20	20	20
Lumber	50	50	50
General merchandise	1,300	1,200	1,150
Coal	2,000	500	.....
Total	7,550	4,320	3,645

REPORT OF MR. R. C. M'CALLA, JR., ASSISTANT ENGINEER.

TUSCALOOSA, ALA., *July 1, 1897.*

MAJOR: I have the honor to submit the following report on Warrior River improvement during the fiscal year ending June 30, 1897:

GENERAL CHARACTERISTICS.

This section of river is really a part of the Black Warrior River, being distinguished from it in the appropriation bills only, and extends from the city of Tuscaloosa, the head of navigation prior to the opening of locks in 1895, about 130 miles to its confluence with the Tombigbee River, near Demopolis.

At Tuscaloosa the river debouches from a narrow valley with high hills and rock bluffs on either side, and enters an alluvial valley several miles in width and subject to an annual overflow. For the first 24 miles the banks are quite stable, but for the next 40 miles are caving rapidly in the bends, causing occasional cut-offs, and a constant change of regimen. There is probably 25 miles of bank on this portion of the river that will have to be revetted before a fixed regimen can be established. For the next 12 miles the concave banks are held by a bastard sandstone, and at Jennings Ferry, 77 miles below Tuscaloosa, the river enters a rotten limestone formation, through which it flows to the mouth. The banks here are stable.

At Tuscaloosa the river drains an area of about 4,900 square miles. Its minimum discharge is about 150 cubic feet per second, and its maximum discharge is probably as great as 150,000 cubic feet per second. Below Tuscaloosa the average width at low water is about 200 feet. There are about ninety sand bars and shoals, two drawbridges of 86½ feet and 92 feet clear opening, and the stream is quite crooked.

GAUGES.

The Tuscaloosa gauge has been read daily at 7 a. m. during the past eight and one-half years. Recently gauges were established at Grays Landing, Finchs Ferry, and Millwood Landing, which have been read daily at 7 a. m. since January 1, 1897, and the Demopolis gauge has been read daily for several years. Vertical iron gauges for the convenience of steamboats were erected during the year on bridge piers at Tuscaloosa and Finchs Ferry. Floods are frequently quite sudden, carry vast quantities of driftwood, and sometimes do immense damage to growing crops and other property.

The high and low water slopes and oscillations of water surface are quite variable, as shown by the following tabular statement:

	Distance.	Low-water fall.	Low-water slope (per mile).	High-water fall.	High-water slope (per mile).
	Miles.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Tuscaloosa to Eagle Shoal	24	0.0	0.00	.....	.....
Eagle Shoal to Grays Landing	17	6.4	.38	.....	.....
Tuscaloosa to Grays Landing	41	.....	.....	26.6	0.65
Grays Landing to Finchs Ferry	32	19.4	.61	8.2	.26
Finchs Ferry to Millwood	28	15.9	.57	15.3	.55
Millwood to mouth	29	18.3	.63	4.6	.16
Total mileage and fall	130	60.00	.....	54.7	.....

Vertical difference between extreme high water and extreme low water:

	Feet.
Tuscaloosa	63
Grays Landing	43.8
Finchs Ferry	55
Millwood Landing	55.6
Demopolis (high water, April, 1874, Weather Bureau)	69.3

NAVIGATION AND COMMERCE.

In its present condition this portion of the river is navigable for small coal tows on an 8-foot stage and for ordinary packets on a 4-foot stage of water. Navigation is usually continuous during January, February, March, and April of each year, and is confined almost entirely to those months. There are occasional rises during May, June, and December, which might be, but are not generally, utilized for navigation. During the remaining five months rises are so rare that it is hardly practicable to utilize them. I have not been able to get hold of any reliable statistics of commerce. During the past season the *Hattie B. Moore*, a large freight and passenger packet, made regular weekly trips for about four months between Mobile and Tuscaloosa, doing a large business. The packet *D. L. Tally* made one trip to Tuscaloosa, and the towboats *Josie W.* and *Baltimore* each made two trips with coal barges from the mines above Tuscaloosa to Mobile and Demopolis, thus transporting about 1,800 tons of coal. A large rafting business is done on the lower part of the river for a lumber mill in Demopolis.

But one attempt at towing coal on what may be considered a commercial scale has yet been made. On the morning of April 23, 1897, the steamer *Josie W.* left Lock No. 1 for Mobile with two coal barges in tow, each 150 long, 24 feet beam, 6 feet deep, and drawing 5 feet. The steamer, 146 feet long, 30 feet 4 inches beam, drawing about 3 feet, carried about 95 tons of coal in addition to fuel. The barges contained 855 tons of coal, making about 950 tons on boat and barges. As the tow passed the gauges the following readings were taken: Tuscaloosa, 8.15, at 9.34 a. m., April 23, 1897; Fosters Ferry, 6.75, at 3.30 p. m., April 23, 1897; Grays Landing, 6.55, at 1.45 p. m., April 24, 1897; Finchs Ferry, 9.25, at 6 a. m., May 2, 1897; Millwood Landing, 9.04, at 5.20 p. m., May 2, 1897, and Demopolis, 9.20, at 2.45 p. m., May 3, 1897.

The pilots and crew were inexperienced in towing and the stage of water was quite low for the first attempt; therefore no attempt was made to run at night. The steering gear broke down several times, causing delay for repair. The barges were grounded several times on sand bars, owing to imperfect knowledge of the channel and inexperience in handling tows on the part of the pilot, causing much delay in pulling off. The river was falling steadily, and the result was that when we reached Morrows Rock, 58 miles down, three days after leaving Tuscaloosa, the chute being filled to some extent with drift sand deposited during the winter, there was not sufficient water for the barges to pass. This was largely due to the loss of time between Tuscaloosa and that point. The barges were thrust into the drift sand as far as they would go and allowed to begin slowly washing through.

After five days' delay at this point a rise of about 3 feet in the river occurred, and the tow proceeded to Demopolis without further incident. A very marked improvement was noticed in the ability of the pilots to handle the tow after a few days' experience, and I have no doubt that the same trip could be made over again by the same crew on the same stage of water without delay or mishap. Total running time from Tuscaloosa to mouth of Warrior River was fifty-one hours thirty-one minutes. I think an experienced crew on a good stage of water will reduce this time to thirty-six hours or less.

These barges are certainly none too large for the river, and this trip has thoroughly convinced me of the practicability of towing coal on a large scale and at a reasonable cost down the Warrior River, on an 8-foot stage at Tuscaloosa and with the river in its present condition. Also, I think that at a moderate cost the river can be put in condition for successful towing on a 6-foot stage at Tuscaloosa.

The banks must be thoroughly cleared near the low-water line to give tows all the room possible on good stages of water. Small timber and bushes should be left to protect the banks from caving. Caving banks should be graded and revetted, and a growth of willows established. In all cases where chutes under points fill with drift sand during the winter, channel should be changed to the concave side of the river and the old chutes made to fill by dikes. In other words, the low-water channel should be forced to conform to the natural high-water current in order to prevent channels from filling during high water. A few rocks that are in the way should be removed by blasting, and all drawbridge openings should be increased to 150 feet. It is probable that tows on this part of the river will rarely exceed 3,000 tons of coal.

Since this first attempt at towing the stage of water has been too low for barge navigation. Three coal mines have been developed on the river above Tuscaloosa since

the opening of the locks for traffic, in the fall of 1895, and are now in condition to put out an aggregate of at least 300 tons of coal per day. These mines are dependent entirely upon the river for transportation, and the coal is of a quality that compares favorably with many other Alabama coals. Two barge-line companies are also in process of preparation to handle this business, and I think there is a fair prospect of a considerable coal traffic down the river next season. The opening of the locks has already reduced the price of coal in Tuscaloosa from 30 to 50 per cent.

PREVIOUS IMPROVEMENT.

While the project of improving this portion of the river by means of locks and dams has been formerly adopted by Congress as a part of the general scheme of affording perennial barge navigation from the Warrior coal fields to the Gulf of Mexico, yet the appropriations have so far been inadequate for beginning the construction of a lock and at the same time carrying on the necessary work of removing snags and other obstructions which are continually accumulating; and for this reason heretofore the work has been confined to cutting overhanging timber, removing snags and other obstructions, doing channel work, constructing jetties, etc.

SNAG BOATS.

During the past year the snag boats *Vienna* and *Demopolis* worked over the river from Bealles Bar to the mouth, a distance of 92 miles. They worked from bank to bank, removing obstructions wherever found and cutting overhanging timber. They removed a number of dangerous rocks and several old wrecks, repaired old jetties, and gave special attention to cleaning bar chutes. They reached the mouth on January 9, 1897, and were towed, one at a time, to Tuscaloosa by the snag boat *Tombigbee* and laid up for the winter.

During the winter the two snag boats, together with all other tools and machinery, were thoroughly overhauled by our machinist and carpenter, each with a small force of helpers. The same shop equipment was used for this work that was used in building the Tuscaloosa locks. Two new barge tenders also were built for the snag boats, at a cost of $986 for both, and the two old snag-boat tenders were converted into a catamaran derrick boat for use in Tuscaloosa channel work. Also a small survey boat was fitted out, preparatory to starting a party on a resurvey of the river from Tuscaloosa to Demopolis, with a view to definitely locating future lock sites.

The two snag boats resumed work at Tuscaloosa on June 1, 1897, working continuously downstream, removing from bank to bank all obstructions which had accumulated during the past winter and cutting heavy timber near the low-water line. During the month of June they worked over 14 miles of river.

CHANNEL WORK.

At Buzzards Bar and Eddins Cut-off extensive channel work, involving a total change in the location of navigable channels, was undertaken and completed without the use of floating plant by means of scrapers and hired mules. The scrapers were furnished by the United States, and the mules were hired from the neighboring farmers, who were paid $1.50 per pair of mules per eight hours, and were required to feed and care for the mules, to furnish all gears, single and double trees, etc., except the scraper, and to take all risk to life and limb of animals they furnished. Overseers were paid $75 per month, laborers $1, and drivers 80 cents per day of eight hours. All employees boarded themselves and lived in the neighborhood, so that no camp equipage was required.

The training walls and dams were built of hand-driven piles, 5 to 6 inches in diameter, 3 feet center to center, interwoven with brush and cane fascine, bound with No. 12 galvanized wire, and ballasted with sand and gravel or earth. The training wall at Eddins Cut-off and the dams at both places had three rows of piles 3 feet apart, with fascines laid diagonally, alternate layers of fascines crossing each other at right angles, and each layer being finished clear across and well ballasted before the next layer was laid. Especial care was taken with the bottom layer to guard against bottom scour. In each structure the piles were all driven before any fascines were laid. They were driven with heavy hand-mauls from plank staging on top of driven piles, which was advanced as the work progressed. The fascines decreased in length from bottom to top of structures, being 12 feet long at the top and 20 to 25 feet long at the bottom, according to depth.

At Buzzards Bar the training wall had two rows of piles 2 feet apart, and the fascines were all of cane and were laid longitudinally. Wagons, teams, and drivers were hired at $2.50 per eight hours to haul the piles and fascines. The materials used were in every case donated by the landowners.

The cost of these improvements may be itemized as follows, no allowance being made for depreciation of tools and office expenses, at Tuscaloosa:

Buzzards Bar.

	Quantity.	Total cost.	Estimated cost— Per foot.	Per cubic yard.
Training wall.....linear feet..	1,608	$289.02	$0.18	.....
Dam.....do....	310	348.47	1.25	.....
Clay excavation.....cubic yards..	524	131.00	.....	$0.25
Sand and gravel excavation.....do....	22,790	3,016.87	.....	.13
Total.....	.....	3,785.36	.....	.....

Eddins Cut-off.

Training wall.....linear feet..	600	$316.94	$0.53	.....
Dam.....do....	225	313.49	1.39	.....
Rock excavation.....cubic yards..	42	42.00	.....	$1.00
Clay excavation.....do....	2,172	543.00	.....	.25
Sand and gravel excavation.....do....	14,515	1,069.29	.....	.11½
Total.....	.....	2,884.72	.....	.....

Sketches of these bars, showing condition after completion of improvements, accompany this report. On a recent inspection it was found that the new channels are in excellent condition, and extensive deposits of drift sand have occurred in the old channels. What were formerly two of the worst bars on the Warrior River now give boats no trouble whatever. They steer through the new channel at full speed.

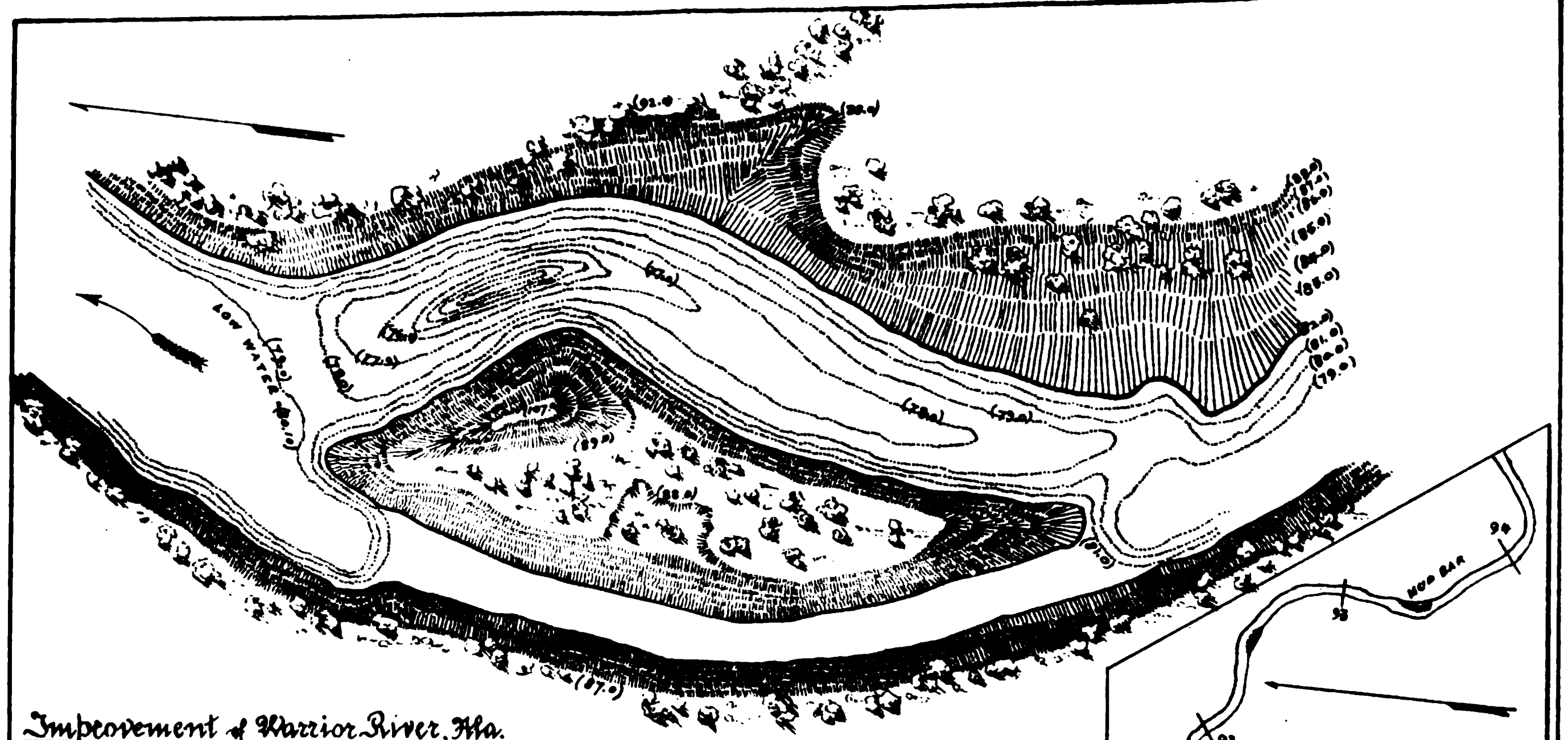
Extensive channel work under the county bridge at Tuscaloosa was begun on July 28, 1893, and has been prosecuted during each low-water season since—about six months per annum. The work consists of cutting through a long rock reef and sand-bar below Lock No. 1. There are two channels, a main low-water channel near the middle of the river and a subsidary draw channel along the south shore. The main channel is to be 150 feet wide and to have a depth of 3 feet below zero of Tuscaloosa gauge for 7 feet below proposed slack-water plane, as fixed by the lower miter sill of Lock No. 1. It is to be used on all stages when boats can pass under the bridge. The lowest part of the bridge superstructure is about 70 feet above the zero of gauge, which is ordinary low water. The draw channel is parallel and adjacent to the main channel, and has 92 feet clear draw opening. Its bottom is 7 feet above bottom of main channel, or just level with proposed slack-water plane. This channel is to be used on all stages when boats can not pass under the bridge.

The work is being done without cofferdamming. The gravel is removed with scapers and mules, and the rock by means of steam drills, dynamite, derrick boats, and barges. The main channel is to be confined through the sand bar with low rock dikes on other side, built of the excavated material.

The draw channel was completed last fall, and work on the main channel was prosecuted from July 1 to December 24, 1896, when it was abandoned for the winter. The following is a statement of the work accomplished on both channels during that period:

	Quantity.	Total cost.	Estimated cost per cubic yard.
Loose rock rehandled.....cubic yards..	2,170	$834.61	$0.38½
Rock excavation in low-water channel.....do....	3,465	4,158.00	1.20
Rock excavation in draw channel.....do....	752	691.55	.92
Sand and gravel excavation in low-water channel.....do....	10,243	.....	.....
Clay excavation in low-water channel.....do....	40	.....	.....
Clay excavation in draw channel.....do....	230	1,636.70	.15½
Total.....	.....	7,320.86	.....

Work was resumed in the low-water channel on June 14, 1897, and the following work accomplished during the remainder of the month: 410 cubic yards rock excavation, 475 cubic yards sand and gravel excavation.



Improvement of Warrior River, Ala.

Buzzard Bar.

— Before Improvement. —

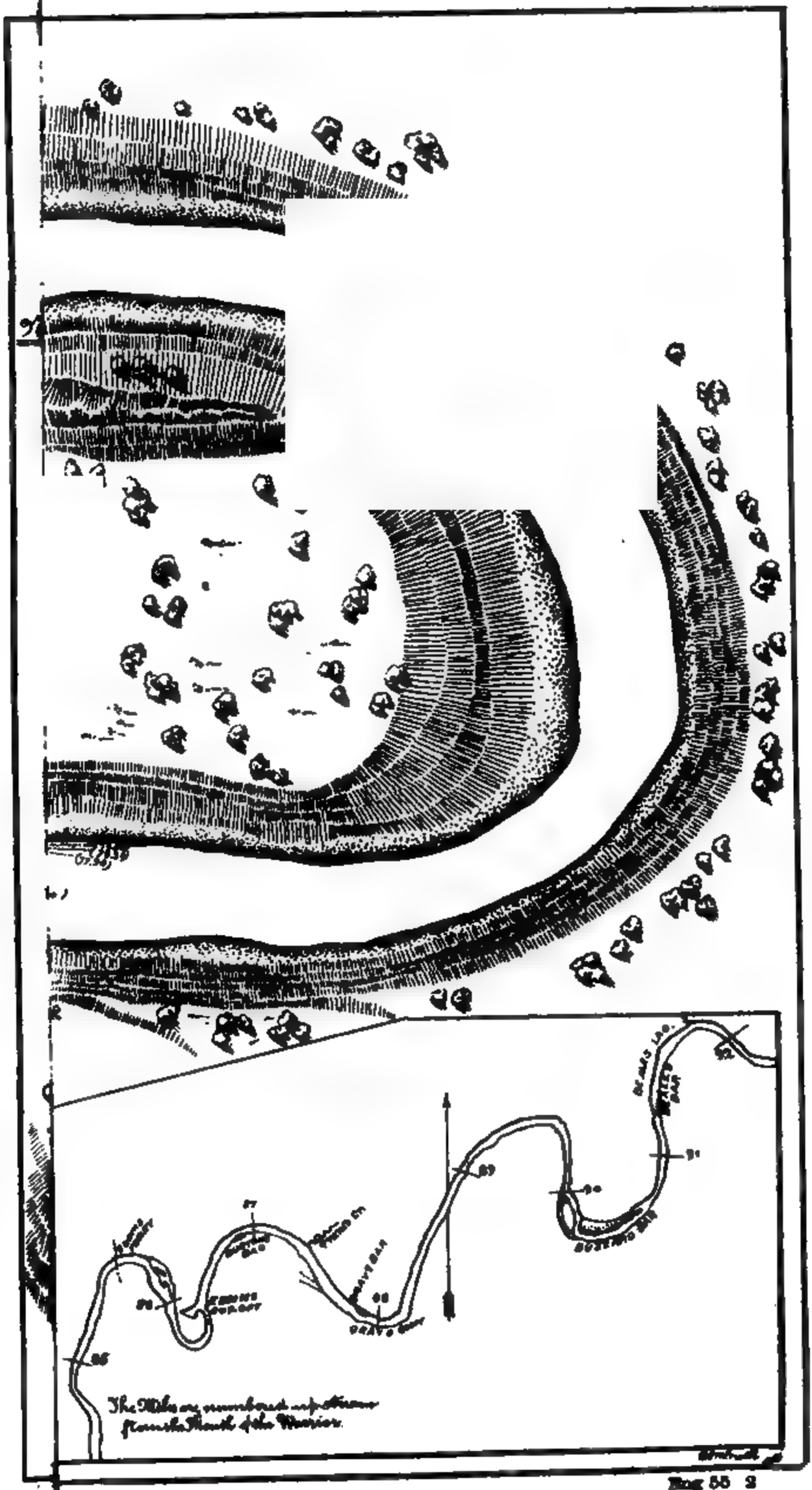
Scale 1/3000

Elevations referred to Mobile Datum

To accompany Report for Fiscal Year ending June 30th. 1897.

Major of Engineers, U.S.A.

The miles are numbered up stream, from the Mouth of the Warrior.


The Miles are numbered up stream
from the Mouth of the Warrior.

Eng 55 2

A sketch showing condition of this improvement on September 19, 1896, accompanies this report. It is estimated that the improvement can be completed by an additional expenditure of $5,000 or $6,000.

SUMMARY OF WORK.

The total work on Warrior River improvement, from Tuscaloosa to Demopolis, during fiscal year ending June 30, 1897, may be itemized as follows, no snags nor other obstructions less than 6 inches in diameter being reported, and trees cut less than 6 inches in diameter being reported as "bushes cut (estimated)":

Number of overhanging trees felled and cut up		6,540
Number of overhanging trees felled and pulled back		3,005
Number of overhanging trees trimmed		228
Number of bushes cut (estimated)		9,937
Number of logs cut up or stumps leveled on bank		2,787
Number of logs removed from drift piles		80
Number of stumps removed from river		1,292
Number of snags removed from river		2,002
Number of logs removed from river		2,822
Wood fuel procured	cords	42
Loose rock rehandled	cubic yards	2,170
Rock excavated	do	5,297
Clay excavated	do	2,376
Sand and gravel excavated	do	48,907
Training wall built	linear feet	2,208
Dams built	do	535
Number of piles driven in dams and training walls		2,367
Brush deposited in dams and training walls	cords	322
Sand and gravel deposited in dams and training walls	cubic yards	1,362
Rock deposited in dams and training walls	do	183
Earth deposited in dams and training walls	do	374

FINAL REMARKS.

The chief difficulty encountered in prosecuting the work between Tuscaloosa and Demopolis is the entire absence, during the working season, of transportation facilities between the working forces along the river and the supply depot and repair shop at Tuscaloosa. It is proposed to remedy this difficulty by building a very light-draft sternwheel boat, propelled by a gas engine, that can navigate the river at extreme low water.

Very respectfully, your obedient servant,

R. C. McCALLA, Jr., *Assistant Engineer.*

Maj. WM. T. ROSSELL,
Corps of Engineers, U. S. A.

(*b*) TOMBIGBEE RIVER FROM ITS MOUTH TO DEMOPOLIS.

This portion of the Tombigbee River forms a part of the line which, with the Black Warrior, Warrior, and Mobile rivers, gives an outlet to the coal from the Warrior fields.

The first surveys for improvement were made in 1870, and from that time to 1888 work of a temporary character only was done.

By act of August 11, 1888, a survey was directed to be made. The report was submitted December 24, 1889. The project proposed was to obtain a channel 6 feet deep at ordinary low water by the removal of snags, logs, and overhanging trees, dredging, bank revetment, and the construction of locks and dams. The length of this section of the river is 191 miles and the estimated cost $508,808.

Actual operations were begun in July, 1891, and have been continued since whenever the stage of water would permit.

Operations during the present fiscal year may be divided into two parts:

(1) Lock and Dam No. 1, at McGrews Shoal, 111 miles from Mobile.

(2) Snagging and dredging carried on with snag boat *Tombigbee* and steam dredge *Black Warrior*.

Work on the cofferdam at Lock No. 1 was carried on through the low-water season, but leaks developed underneath the dam and through it along the lines of braces, so that it was not possible to empty the dam of water before the rising river stopped the work. Since the river has fallen, work has been undertaken on interior bulkhead. This will probably be finished by July 10, 1897. If the dam can not then be pumped out, I propose to cut up the inclosed space into four sections, when it is believed they can be emptied and the lock built in sections.

During high water, while work on the cofferdam was impossible, a force of mechanics was kept busy on the framing of the iron gates. They have also made a small model of the proposed lock in wood.

The dredge boat *Black Warrior* was employed on the following bars, Osage, Thompsons, Turners, and Wilsons, and her work at those places consisted in removing—

Snags		11
Rock	cubic yards	3,470
Clay, gravel, and sand	do	4,708
Overhanging trees pulled back		5
Logs on bank cut up		1

The snag boat *Tombigbee* continued work upstream and has reached Sucarnochee Bar, 214 miles above Mobile. This boat was also used for towing the snag boats *Vienna* and *Demopolis* from Demopolis to Tuscaloosa and the snag boat *Noxubee* from Mobile to Demopolis.

During the year the *Tombigbee* accomplished the following:

Number of cuts made	1,170
Snags removed from river	1,995
Overhanging trees felled and pulled back	49
Logs on bank cut up	24
Stumps removed	159
Piles of drift removed	2

During the high-water season both the *Black Warrior* and *Tombigbee* were put in good repair.

The total amount expended on this improvement to June 30, 1897, is $246,528.53.

The rise to be overcome by locks and dams to reach Demopolis, Ala., is 28.37 feet, and will require three locks. I estimate that these will cost not less than $250,000 each, or $750,000; or, in addition to appropriations heretofore made, $600,000.

Money statement.

July 1, 1896, balance unexpended		$176,818.41
June 30, 1897, amount expended during fiscal year		93,346.94
July 1, 1897, balance unexpended		83,471.47
July 1, 1897, outstanding liabilities	$1,900.84	
July 1, 1897, amount covered by uncompleted contracts	10,573.47	
		12,474.31
July 1, 1897, balance available		70,997.16
Amount (estimated) required for completion of existing project		*600,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		200,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

*New estimate furnished by authority of letter from Chief of Engineers, dated August 7, 1896.

Appropriations have been made as follows:

Act of September 19, 1890	$55,000
Act of July 13, 1892	125,000
Act of August 18, 1894	75,000
Act of June 3, 1896	75,000
Total	330,000

The following contract is in force: With W. Chase Spotswood, for gravel and sand, approved July 14, 1896; work beginning July 15, 1896, and to be completed on or before the 1st day of July, 1898.

COMMERCIAL STATISTICS.

Articles.	1897.	1896.	1895.
	Tons.	*Tons.*	*Tons.*
Cotton	7,800	8,350	7,000
Grain	5,525	4,420	5,010
Iron	95	92	100
Lumber	67,240	66,360	12,175
General merchandise	13,219	13,744	13,006
Coal	1,500	500	.....
Total	95,379	93,466	37,291

(*c*) TOMBIGBEE RIVER FROM DEMOPOLIS TO COLUMBUS, MISS.

For the original condition, project and estimates, and history of this work, see Annual Report of the Chief of Engineers for 1896, Part III, pages 1443 and 1444.

Under the appropriation of $50,000 made by act of June 3, 1896, and with the balance on hand from former appropriations, work on the improvement of this section of the river was in progress on July 1, 1896. The steam capstan snag boat *Noxubee* continued the work upstream at a point 3 miles above Jones Bluff, and carried the improvement up to 2 miles above Hancock Bar. On November 26, 1896, the *Noxubee* returned downstream, going over the work again, and reached Demopolis, Ala., in the latter part of December, 1896. The boat, being in need of some repairs to her bottom, was carried to Mobile, Ala., hauled out, repaired, and laid up.

On May 8, 1897, the snag boat *Noxubee* was towed up to Demopolis, Ala., and work on the improvement of the river above Demopolis was resumed upstream, reaching Gainesville, Ala., June 30, 1897.

The snag boat *Pickensville* and quarter boat *Fulton* were transferred from the river above Columbus, Miss., and commenced operations from Columbus downstream on September 2, 1896. In January, 1897, work was suspended on account of high water, the boats laid up at Jones Bluff, Ala., and slight repairs made to the *Pickensville*.

On May 8, 1897, a camping party was organized at Columbus, Miss., and removed some troublesome obstructions between Columbus and the head of Ten Mile Shoal, 19 miles, complained of by steamboats. This was completed on May 31, 1897.

The following is a statement of work performed during the fiscal year ending June 30, 1897:

Snags pulled, cut, and removed		2,635
Sunken logs and trees pulled, cut up, and removed		804
Stumps leveled, blasted, and removed from river		1,166
Logs and stumps on banks leveled and blasted		1,279
Drift piles removed		52
Overhanging trees felled, pulled back, cut up, and removed		2,136
Trees trimmed		56
Bushes cut and removed	cords	73
Jetties repaired	linear feet	418
Piles for jetties driven		150
Mattresses made and sunk for jetties	square feet	1,604
Brush cut and sunk for jetties	cords	12
Rock excavated and sunk for jetties	cubic yards	220
Gravel and sand excavated	do	540
"Slip-ins" removed		6

The total amount expended on the improvement of this section of the river up to June 30, 1897, is $82,312.30.

The appropriations for the permanent improvement of this stretch of the river should be separated from that intended for snagging and temporary work.

The fall in this river from Columbus, Miss., to Demopolis, Ala., is 107.8 feet, and there will be required 10 locks and dams to give slack water navigation. These will cost $2,000,000.

Money statement.

July 1, 1896, balance unexpended	$84,774.00
June 30, 1897, amount expended during fiscal year	17,086.30
July 1, 1897, balance unexpended	67,687.70
July 1, 1897, outstanding liabilities	252.71
July 1, 1897, balance available	67,434.99
Amount (estimated) required for completion of existing project	*2,000,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	500,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following appropriations have been made:

By act of—

September 19, 1890	$15,000
July 13, 1892	35,000
August 18, 1894	50,000
June 3, 1896	50,000
Total	150,000

COMMERCIAL STATISTICS.

Article.	1897.	1896.	1895.
	Tons.	*Tons.*	*Tons.*
Cotton	2,175	2,062	3,500
Grain	1,689	1,105	2,508
Iron	24	20	31
Lumber	16,820	16,590	7,000
General merchandise	4,149	3,436	7,103
Total	24,857	23,213	20,142

*New estimate furnished by authority of letter from Chief of Engineers, dated August 7, 1896.

(*d*) TOMBIGBEE RIVER FROM FULTON TO COLUMBUS.

A survey of this portion of the river was made under the act of June 10, 1872. Report thereon was submitted September 20, 1873.

The project adopted was to improve high-water navigation from Fulton to Columbus, a distance of 144 miles, by removal of all timber obstructions above low water, and to clear the banks of overhanging trees, at an estimated cost of $35,000, and $5,000 annually for preservation.

The original project was completed at a cost of $27,293.65.

The following is a statement of the work performed up to June 30, 1896:

Stumps cut, leveled, and blasted	1,048
Snags cut and removed	165
Logs on banks cut up	2,516
Overhanging trees felled, pulled back, cut up, and removed	7,357
Drift piles removed	58
Logs pulled and cut up	2
Piles cut and hauled	90
Piles driven for closing slough	36
Fascines made and sunk	291
Gravel and clay excavated, wheeled, and filled in ....cubic yards..	1,080
Posts and braces cut	76

A temporary bridge was constructed across a branch 15 feet wide, for hauling and wheeling gravel, brush, piling, braces, lumber, etc. One hundred and eighty linear feet of the old jetties were repaired.

The total amount expended up to June 30, 1896, is $6,663.44, in preservation of the improvement.

On June 1, 1897, work on the preservation of the improvement was resumed at Columbus, Miss., working upstream, reaching a point 1½ miles above Waverly, Miss., 7½ miles above Columbus.

The following is a statement of work performed during the fiscal year ending June 30, 1897:

Snags pulled, cut up, and removed	157
Stumps leveled, blasted, and removed	24
Sunken logs and trees pulled and removed	192
Logs and stumps on banks cut up	107
Overhanging trees felled, pulled back, cut up, and removed	708
Bushes cut ....running feet..	270
Rock excavated and blasted ....cubic yard..	1

The total amount expended in the preservation of this improvement up to June 30, 1897, is $10,076.81.

Money statement.

July 1, 1896, balance unexpended	$11,336.56
June 30, 1897, amount expended during fiscal year	3,413.37
July 1, 1897, balance unexpended	7,923.19
July 1, 1897, outstanding liabilities	113.92
July 1, 1897, balance available	7,809.27
Amount (estimated) required for maintenance of existing project	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	5,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

The following appropriations have been made specifically for preservation of this section of the river:

By act of—	
July 13, 1892	$6,000
August 18, 1894	4,000
June 3, 1896	8,000
Total	18,000

COMMERCIAL STATISTICS.

Articles.	1897.	1896.
	Tons.	*Tons.*
Pine, cypress, and oak logs	32,192	20,000

This includes the commerce on Tombigbee River from Walkers Bridge to Fulton. It was impossible to separate them.

(*e*) TOMBIGBEE RIVER FROM WALKERS BRIDGE TO FULTON.

An examination was made of this section of the river under act of March 3, 1881, and August 5, 1886.

The project adopted was the opening of a channel for high-water navigation from Fulton to Walkers Bridge by the removal of snags, logs, and overhanging trees, at an estimated cost of $11,000.

Work on the preservation of this improvement was commenced in September, 1892, and continued at intervals up to April 10, 1897.

The following is a statement of work performed up to June 30, 1896:

Trees felled, pulled back and removed	6,692
Logs removed	1,085
Drift piles removed	17
Stumps leveled and removed	1,329
Snags cut and removed	258
Logs on banks cut up	590

The following is a statement of work performed during the fiscal year ending June 30, 1897:

Snags pulled, cut up, and removed	62
Sunken logs pulled, cut, and removed	114
Sunken trees pulled, cut, and removed	93
Stumps leveled, blasted, and removed	80
Logs and stumps on banks cut up	146
Logs from drift piles removed	32
Overhanging trees felled, pulled back, cut, and removed	1,042
Bushes cut ..... cords..	2

Twenty-one and one-half miles of river, from Walkers Bridge down, were reworked.

The condition of this section of the river on June 30, 1897, is such as to allow large sized rafts to be floated downstream on a 3-foot rise above ordinary low water.

The total amount expended on the improvement up to June 30, 1896, was $10,982.07, of which $3,390.96 was in preservation of the improvement.

The total amount expended on this improvement up to June 30, 1897, is $12,659.20.

Money statement.

July 1, 1896, balance unexpended	$2,017.93
June 30, 1897, amount expended during fiscal year	1,677.14
July 1, 1897, balance unexpended	340.79
Amount (estimated) required for maintenance of existing project	1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	1,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

The following appropriations have been made:

By act of—	
August 11, 1888	$4,000
September 19, 1890	4,000
July 13, 1892 (maintenance)	3,000
August 18, 1894 (maintenance)	1,000
June 3, 1896 (maintenance)	1,000
Total	13,000

Under these appropriations work was commenced at Fulton, November, 1888, and continued at intervals up to June 30, 1891, and the project completed.

For commercial statistics, see report on Tombigbee River from Fulton to Columbus.

Q 5.

IMPROVEMENT OF NOXUBEE RIVER, MISSISSIPPI.

The examination of this river provided for by act of Congress approved March 3, 1879, was made during the month of May, 1880, and extended from Macon, Noxubee County, Miss., to the mouth of the river. Report thereon is contained in Annual Report of the Chief of Engineers for 1880.

The condition of the river when examined was such that during all seasons of the year and at all stages of water, navigation, except by small flatboats, was practically impossible. Prior to the building of the Mobile and Ohio Railroad (1859) steamboats plied the river. After the construction of this railroad the boats were withdrawn. The chief obstructions to navigation consisted in the immense number of trees overhanging the river throughout the entire length.

At the time of the examination the minimum depth of the river was found to be (at ordinary low water) 1½ feet and the average width 60 feet.

The project adopted was to afford a navigable channel during high water, or for about five months, to the town of Macon, by the removal of overhanging timber from the banks and such obstructions to navigation as might be found in the river. The estimated cost was $65,245.25.

Work was commenced on the river during the low-water season of 1880 and continued at intervals to October, 1889, and resulted in the completion of the project, at an estimated cost of $49,712.54.

Operations from November, 1889, to May, 1894, were confined to repairing and caring for the working plant and other public property.

At the beginning of the fiscal year ending June 30, 1895, work was in progress (having been begun May 1, 1894), removing such obstructions as had accumulated since the last previous work. This work was con-

tinued until December 30, 1894, when the mouth of the river was reached and work was suspended, the river having been again completely cleared.

The following is a summary of the work performed:

Overhanging trees felled and removed	4,529
Logs on banks cut up	2,615
Piles of drift removed	13
Snags and stumps removed	1,211

The river is now and has been since October, 1889, navigable at high water up to Macon, but it will require an expenditure of $3,000 every year or so to maintain it in its improved condition.

During the year 1889 one boat made several trips up the river, but was withdrawn, and no boats have since plied it, the railroads having lowered freight rates to such an extent as to keep all business away from the river. The value of the trade of Macon and vicinity is estimated at half million dollars annually in each direction, and the saving in freight, owing to the river being open, would be $20,000 each year.

The amount expended on the improvement of this river up to June 30, 1896, is $58,096.81. Of this amount $8,384.27 was in maintenance of the improvement.

No work has been done during the fiscal years ending June 30, 1896 and 1897, and no expenses were incurred.

Money statement.

July 1, 1896, balance unexpended	$3,903.19
July 1, 1897, balance unexpended	3,903.19
Amount (estimated) required for maintenance of existing project	3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	3,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The appropriations made for this improvement are as follows:

By act of—	
June 14, 1880	$12,000
March 3, 1881	8,000
August 2, 1882	10,000
July 5, 1884	7,500
August 5, 1886	7,500
August 11, 1888	5,000
September 19, 1890	3,000
September 13, 1892 (maintenance)	3,000
August 18, 1894 (maintenance)	3,000
June 3, 1896 (maintenance)	3,000
Total	62,000

There is no commerce or navigation on this river.

Q 6.

IMPROVEMENT OF PASCAGOULA RIVER, MISSISSIPPI.

For the original condition and the history, etc., of the work, see pages 1448, 1449, and 1450 of the Annual Report of the Chief of Engineers for 1896, Part III.

The present project for the improvement of this river, from Moss Point, Miss., to the junction of the Leaf and Chickasahay rivers—that

of 1886—is to maintain the river above Moss Point in the improved condition, at an estimated cost of $2,500 annually.

By allotments from the different appropriations, work on the river above Moss Point was carried on by hired labor up to June 30, 1896.

The following is a statement of work performed up to June 30, 1896:

Snags pulled, cut up, and removed	2,409
Sunken logs pulled, cut up, and removed	633
Logs on banks cut up	477
Overhanging trees felled, pulled back, cut up, and removed	6,674
Stumps leveled and blasted	285
Stumps removed from river	82
Trees trimmed	52
Bushes cut	3,500

The amount expended on the preservation of the improvement to June 30, 1896, was $10,487.60.

The condition of the improvement of this river on June 30, 1896, was such as to allow vessels of 6½ feet draft to navigate a distance of 52 miles from the mouth all the year; from there up to the junction of the Leaf and Chickasahay rivers very little work has been done of late years, and can be navigated only during a 5 or 6 foot rise above ordinary low water. Under an appropriation of $6,000, made by act of June 30, 1896, work on the river above Moss Point was resumed at a point a little above Dead Lake, on July 25, 1896, and continued until February 13, 1897, reaching Cedar Creek on that date, 55 miles above the mouth.

The following is a statement of work performed during the year ending June 30, 1897:

Snags pulled, cut, and removed	952
Sunken logs and trees pulled, cut, and removed	33
Stumps leveled, blasted, and removed	84
Logs on banks cut up	78
Overhanging trees felled, pulled back, cut up, and removed	3,355

The condition of the river and of the improvement on June 30, 1897, is such as to allow vessels of 6½ feet draft to navigate up to Cedar Creek, a distance of 55 miles, all the year. Above Cedar Creek no work has been done, and the river is in about the same condition as when reported last.

The results obtained by the improvement of this river are greater width and depth of the channel, giving greater security to steamboat navigation up to Cedar Creek, and allowing larger rafts of logs and timber to be carried downstream. Large tracts of valuable bottom lands have been reclaimed, which before the improvement were subject to overflow.

The "act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," of August 18, 1894, contains the following:

> Improving Pascagoula River, Mississippi: Continuing improvements, $13,000; and so much of said sum as may be necessary may be used for the removal of the bar in Horn Island Pass.

Act of June 3, 1896, contains the following:

> Improving Pascagoula River, Mississippi: Continuing improvements, $6,000; and so much of said sum as may be necessary may be used for the removal of the bar in Horn Island Pass.

A survey for the improvement of Horn Island Pass, Mississippi, was made in October, 1896, under the river and harbor act of June 3, 1896. Report thereon was submitted January 18, 1897.

The project adopted was to dredge a channel 21 feet deep at mean low water through the pass, at a cost not to exceed $8,000.

Under date of February 11, 1897, contract was entered into with the Rittenhouse-Moore Dredging Company, of Mobile, Ala., for the removal of a shoal in what is known as the "Outer Bar" in Horn Island Pass, being 200 feet wide and 1,300 feet long, on which there was a least depth of 18.7 feet at mean low water, the contractor to be paid at the rate of 40 cents per cubic yard.

Dredging operations were commenced on March 8, 1897, with the suction dredge *Jumbo*, carrying capacity 773.6 cubic yards, attended by steam tug *U. S. Grant*, and were completed on April 17, 1897, by the removal of 18,616 cubic yards of very fine white sand, and the result was a cut 200 feet wide and 1,300 feet long, with an average depth of 20.5 at mean low water, for its entire width and length.

I inclose a plat showing location of this work, depths made, and sailing lines through the pass.

The total cost of dredging this shoal in Outer Bar was $7,682.40.

The total amount expended on the improvement of this river up to June 30, 1897, is $199,646.77.

Money statement.

July 1, 1896, balance unexpended	* $13,777.79
June 30, 1897, amount expended during fiscal year	12,924.56
July 1, 1897, balance unexpended	853.23
July 1, 1897, outstanding liabilities	68.18
July 1, 1897, balance available	785.05
Amount (estimated) required for completion of existing project	42,185.42
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following appropriations have been made:

By act of—	
March 2, 1827	$8,000
May 23, 1828	17,500
August 30, 1852	5,000
Total	30,500

By act of—	
June 17, 1878	10,000
March 3, 1879	14,000
June 14, 1880	20,000
March 3, 1881	4,000
August 2, 1882	8,000
July 5, 1884	3,000
Total	59,000

By act of—	
August 5, 1886	20,000
August 5, 1886, transferred amount appropriated for improving Horn Island Pass, act of July 5, 1884	5,000
August 11, 1888	27,000
September 19, 1890	20,000
July 13, 1892	20,000
August 18, 1894	13,000
June 3, 1896	6,000
Total	111,000

* Erroneously reported as $13,827.79, June 30, 1896.

HORN
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referred to mean
To accomp

Abstract of proposal for dredging at Horn Island Pass, Mississippi, opened January 22, 1897.

Name and address of bidder.	Price per cubic yard.	Time of commencing work and completion.
	Cents.	
Rittenhouse Moore Dredging Co	40	In accordance with specifications.

COMMERCIAL STATISTICS.

Comparative statement tabulated from information furnished by the United States custom-house.

Vessels cleared.	1897.		1896.	
	Number.	Tons.	Number.	Tons.
Foreign	150	62,614	175	98,712
Domestic	37	17,038	41	16,610
Via Ship Island	.....	85,764	.....	42,796
Total	187	105,416	216	158,118

Coastwise shipments not included in the United States custom-house statement.

Articles.	1897.		1896.	
	Tons.	Value.	Tons.	Value.
Lumber and timber	36,649	$218,795	14,654	$134,194
Rosin	3,600	54,000	3,000	45,000
Turpentine	800	58,000	600	45,000
Charcoal	7,800	39,000	4,438	35,500
General merchandise	127	1,020	197	3,880
Total	48,976	370,815	22,889	263,574

Q 7.

IMPROVEMENT OF CHICKASAHAY RIVER, MISSISSIPPI.

The act of Congress of August 11, 1888, provided for an examination of Chickasahay River, Mississippi, from its mouth to Enterprise, and report thereon was submitted on February 16, 1889.

The approved project was to clear the channel from its mouth to the railroad bridge near Shubuta, Miss., by removal of snags, logs, and overhanging trees, at an estimated cost of $30,000.

The following is a statement of the total work performed up to June 30, 1896:

Snags cut, trimmed, blasted, and removed		14,836
Stumps leveled, blasted, and removed		1,775
Trees trimmed		5,832
Overhanging trees felled, pulled back, and removed		11,364
Logs on banks cut up		18,589
Bushes cut		12,180
Rock blasted and removed	cubic yards..	28
Clay excavated and removed	do	12

The following is a statement of the total work performed during the fiscal year ending June 30, 1897:

Snags cut, trimmed, blasted, and removed	9,027
Stumps cut, trimmed, blasted, and removed	1,303
Logs on banks cut up	5,469
Logs removed from drift piles	401
Sunken logs pulled and removed	681
Trees trimmed	15
Overhanging trees felled, pulled back, and removed	7,892
Bushes cut (estimated)	9,570

The work has resulted in giving a good high-water channel from Waynesboro, Miss., to the mouth, allowing small steamboats to run on a 4-foot stage above low water as far as the Mobile and Ohio Railroad Bridge, near Buckatunna, Miss., and larger rafts of logs and timber to be brought down from above Waynesboro.

One hundred and four and one-half miles of river, from the mouth up to the railroad bridge, have been fully improved according to project. No work has yet been done above Waynesboro. It is the opinion of the principal business men, timbermen, and logmen of Wayne County, Miss., that all that the present commerce required is the improvement of the river from the mouth up to the Mobile and Ohio Railroad Bridge, near Buckatunna, Miss., for light-draft steamers during six or eight months of the year, and that the river above the bridge be improved only for rafting and logging. This, it is claimed, would satisfy all parties interested in the river. It is stated that a very small steamer made only one trip above the bridge last year, and then only to Waynesboro. All the freight for the different towns along the river is hauled by the Mobile and Ohio Railroad, which runs almost parallel with the river, and within easy reach of Enterprise, Miss., which is considered the head of navigation.

The total amount expended on this improvement up to June 30, 1897, is $16,970.96.

Money statement.

July 1, 1896, balance unexpended	* $3,483.08
June 30, 1897, amount expended during fiscal year	3,454.04
July 1, 1897, balance unexpended	29.04
Amount (estimated) required for completion of existing project	13,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	2,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following appropriations have been made:

By act of—	
September 19, 1890	$5,000
July 13, 1892	5,000
August 18, 1894	5,000
June 3, 1896	2,000
Total	17,000

* Erroneously reported as $3,533.08, June 30, 1896.

COMMERCIAL STATISTICS.

Articles.	1897.	1896.
	Tons.	*Tons.*
Logs and timber	15,650	22,105
Rosin	300	2,000
Turpentine	80	400
General merchandise	.....	268
Total	16,030	24,773

NOTE.—There was no steamboat on the river during the year.

Q 8.

IMPROVEMENT OF LEAF RIVER, MISSISSIPPI.

The act of Congress of August 11, 1888, provided for an examination of Leaf River from its mouth to the mouth of Bowie Creek, near New Orleans and Northeastern Railroad, and report thereon was submitted February 15, 1889.

The approved project was to clear a channel from its mouth to Bowie Creek for high-water navigation by the removal of snags, logs, and overhanging trees, 75 miles, at an estimated cost of $25,000.

The following is a statement of the total work performed up to June 30, 1896:

Snags pulled, cut up, and trimmed	2,081
Sunken logs and trees removed	110
Overhanging trees felled, pulled back, cut, and removed	5,804
Logs on banks cut up	2,691
Stumps leveled, blasted, and removed	5,412
Trees trimmed	1,351
Bushes cut and removed	1,760
Drift piles removed	53

The following is a statement of the work performed during the fiscal year ending June 30, 1897:

Snags pulled, cut up, trimmed, and removed		781
Sunken logs and trees removed		1,396
Stumps leveled, blasted, and removed		1,452
Logs and stumps on banks cut up		1,174
Overhanging trees felled, pulled back, cut, and removed		733
Trees trimmed		61
Bushes cut		495
Gravel and sand excavated	....cubic yards..	8

About 56 miles of river, from Bowie Creek to Carters Bluff—downstream—was reworked.

This work has resulted in giving a good high-water channel from Bowie Creek to the mouth, thus virtually completing the project. In order to preserve the improvement, however, the entire distance will have to be worked over from year to year, removing the annual accumulation of obstructions.

The total amount expended on the improvement of this river up to June 30, 1897, is $14,103.32.

Money statement.

July 1, 1896, balance unexpended	$5,323.60
June 30, 1897, amount expended during fiscal year	4,426.92
July 1, 1897, balance unexpended	896.68
July 1, 1897, outstanding liabilities	30.00
July 1, 1897, balance available	866.68
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	5,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following appropriations have been made:

By act of—

September 19, 1890	$5,000
July 13, 1892	5,000
August 18, 1894	2,500
June 3, 1896	2,500
Total	15,000

COMMERCIAL STATISTICS.

Articles.	1897.	1896.
	Tons.	*Tons.*
Saw logs and timber	83,640	62,625
Rosin	440	.....
Turpentine	80	.....
Total	84,160	62,625

Q 9.

IMPROVEMENT OF PEARL RIVER BELOW JACKSON, MISSISSIPPI.

The original project for improving this section of the river was adopted in 1880, the object being to obtain a navigable channel of 5 feet from Jackson down to the mouth at low water, a distance of 312 miles, by the removal of snags, stumps, logs, overhanging trees, and closing run-out bayous, at an estimated cost of $95,940, based upon the report of a survey made during March and April, 1879.

Upon an examination made at low water in December, 1884, it was found that a 5-foot channel at low water was not practicable by the method proposed, but that a 2-foot channel at low water could be obtained in that manner, and was all that the present commerce of the river required.

Owing to the large amount of obstructions found during the examination, the river being considerably lower at that time than during the survey in 1879, the modification of the original project to 2 feet, and the increased estimate to $145,940 was approved in 1885.

In addition to the improvement of the river proper, the increased lumber trade of the mills situated on East Pearl River demands the dredging of the channel over the bar at the mouth of East Pearl River to 12 feet, a rough estimate of the cost of which is $20,000.

For the history of the work see Annual Report of the Chief of Engineers for 1896, Part III, pages 1455 and 1456.

The condition of the river on June 30, 1896, was such as to allow light-draft boats to navigate from the mouth to Cannons Creek all the year. The river from Cannons Creek to Monticello, Miss., had been partially improved before, and is in a fairly navigable condition. Boats can therefore run up to Monticello, Miss., 160¾ miles, at an ordinary low stage of water all the year. From Monticello, Miss., to Jackson, Miss., 151¼ miles, the river had been only partially improved during 1880 and 1881 by contract, but navigation is not possible now except during a 7-foot rise above ordinary low water.

The reduction in freights and insurance due to river improvements is considerable.

The total amount expended on the improvement of this section of the river to June 30, 1896, was $138,179.65, of which $35,192.32 was in preservation of the improvement.

Under the appropriation of $10,000, made by act of June 3, 1896, the work on the improvement of this section of the river was confined to that portion from the head of Holmes Bayou to Monticello, Miss. This was approved by letter from the office of the Chief of Engineers, dated July 24, 1896.

Work on that portion was commenced with snag boat No. 1 at the head of Holmes Bayou in June, 1897, and carried on upstream to a point 2 miles above Holmes Bayou, Louisiana.

Snag boat No. 2 commenced work at Laytons Bluff, La., on October 20, 1896, working upstream toward Monticello, Miss., reaching a point 2⅛ miles above the bluff. On account of high water work with snag boat No. 2 was suspended on January 6, 1897. Snag boat No. 1 was hauled out and repaired. Work with snag boat No. 2 was resumed on June 16, 1897, at a point 2⅛ miles above Laytons Bluff, and carried upstream.

The following is a statement of work performed up to June 30, 1896:

Snags pulled, cut up, and removed		9,427
Roots blasted and removed		6,808
Sunken logs pulled and removed		5,372
Stumps leveled, blasted, and removed		2,438
Knees removed		87
Standing trees felled, cut, and removed		1,693
Overhanging trees felled, pulled, cut, and removed		43,947
Logs on bank cut up		417
Trees deadened		2,936
Trees trimmed		206
Bushes cut		2,825
Drift piles removed		126
Sand and clay excavated and removed	cubic yards	12,098½
Cane cut and removed	running yards	9,422
Piles driven for jetties		256
Willows planted for jetties	cords	636
Trees felled, transported, and sunk for jetties		1,531
Sunken logs and trees pulled for jetties		116
Willow cut, made into mattresses, and sunk	cords	618
Clay excavated, transported, and sunk for jetties	cubic yards	3,220

The following is a statement of work performed during the fiscal year ending June 30, 1897:

Snags pulled, cut up, and removed		924
Sunken logs pulled, cut up, and removed		30
Stumps removed from river		95
Logs and stumps blasted and removed from banks		432
Overhanging trees felled, pulled, and removed		2,093
Drift piles removed		51
Bushes cut	cords	14

The total amount expended on this improvement, including repair of snag boats, up to June 30, 1897, is $143,896.53.

The condition of the improvement of this section of river on June 30, 1897, is such as to allow light-draft boats to navigate all the year from the mouth up to Monticello, Miss., 160¾ miles.

The results obtained by the improvement are greater security to steamboat navigation by increased width and depth of channel and assisting larger rafts of logs and timber to be brought down. Large tracts of valuable bottom lands have been reclaimed and are now being cultivated which before the improvement were subject to overflow.

Money statement.

July 1, 1896, balance unexpended	$19,945.35
June 30, 1897, amount expended during fiscal year	5,716.87
July 1, 1897, balance unexpended	14,228.48
July 1, 1897, outstanding liabilities	460.63
July 1, 1897, balance available	13,767.85
Amount (estimated) required for completion of existing project	40,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

The following appropriations have been made.

By act of—		By act of—	
June 14, 1880	$30,000	September 19, 1890	$20,000
March 3, 1881	25,000	July 13, 1892	15,000
August 2, 1882	15,000	August 18, 1894	5,000
July 3, 1884	10,000	June 3, 1896	10,000
August 5, 1886	13,125		
August 11, 1888	15,000	Total	158,125

COMMERCIAL STATISTICS 1897.

Articles.	Tons.	Articles.	Tons.
Cotton	540	Cord wood	3,700
Rosin	600	Charcoal	10
Turpentine	90		
Staves	7	Total	4,947

Q 10.

IMPROVEMENT OF PEARL RIVER BETWEEN CARTHAGE AND JACKSON, MISSISSIPPI.

The original project was to afford a clear channel of navigable width and 5 feet deep at low water from Carthage to Jackson, a distance of 105 miles, at an estimated cost of $21,000.

In 1886 the depth to be obtained was reduced to 2 feet, and the estimate was increased $29,000, making the total estimate $50,000.

The original condition of this portion of the river was such as to permit navigation only during high water, and even then it was difficult and dangerous.

An examination of this part of the river was made in 1879, and report thereon is contained in the Annual Report of the Chief of Engineers of 1879 (Appendix K 2).

The following is a statement of the total amount of work performed up to June 30, 1897:

Snags pulled, cut up, trimmed, and removed	81,945
Stumps leveled, cut, blasted, and removed	4,614
Sunken logs pulled, cut up, and removed	5,238
Sunken trees pulled, cut up, and removed	795
Logs on banks cut up	10,816
Drift piles removed	109
Overhanging trees felled, pulled back, and removed	18,987
Trees trimmed	2,779
Bushes cut	70,146

The project is completed. The work to be done hereafter with the new appropriation will be for preservation of the improvement.

The condition of this section of Pearl River on June 30, 1896, is such as to allow light-draft boats to navigate safely on a 3-foot rise above ordinary low water from Carthage down to Jackson.

The total amount expended on the improvement of this section of the river up to June 30, 1896, is $33,650, of which $8,634.66 was for preservation of the improvement.

The reduction in freight and insurance due to river improvement is considerable.

During the latter part of June, 1897, preparations for resuming work on July 1, 1897, were made.

The total amount expended on the improvement of this river up to June 30, 1897, is $34,890.21.

Money statement.

July 1, 1896, balance unexpended	$2,400.00
June 30, 1897, amount expended during fiscal year	300.40
July 1, 1897, balance unexpended	2,099.60
Amount (estimated) required for maintenance of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	2,500.00

The following appropriations have been made:

By act of—		By act of—	
March 3, 1879	$6,000	September 19, 1890	$3,000
June 14, 1880	7,500	July 13, 1892	5,000
March 3, 1881	2,500	August 18, 1894	2,400
August 2, 1882	2,500	June 3, 1896	2,400
August 6, 1886	2,250		
August 11, 1888	2,500	Total	36,050

COMMERCIAL STATISTICS.

Articles.	1897.	1896.
	Tons.	*Tons.*
Cotton	50	300
Staves	200	270
Total	250	570

Q 11.

IMPROVEMENT OF PEARL RIVER, MISSISSIPPI, BETWEEN EDINBURG AND CARTHAGE.

A survey of this part of the Pearl River was made during November, 1883, and report thereon is contained in the Annual Report of the Chief of Engineers of 1884 (Appendix Q 18).

The original project was to afford a high-water channel from Edinburg to Carthage, a distance of 24¾ miles, for six or eight months of the year, at an estimated cost of $13,464.

The following is a statement of the total work performed up to June 30, 1897:

Snags, stumps, logs, and trees blasted, cut up, and trimmed		161, 161
Standing trees cut and removed		368
Stumps blasted and removed		1, 687
Logs on banks cut up		2, 446
Fallen trees removed		94
Overhanging trees felled, pulled back, and removed		22, 441
Trees trimmed		1, 340
Bushes cut		52, 665
Banks cleared of brush	yards	6, 491
Drift piles removed		42

The condition of this portion of the river on June 30, 1897, is such as to allow light-draft boats to navigate safely from Edinburg to Carthage on a 4-foot rise above ordinary low water.

The project is completed; the work to be done with the balance on hand from the appropriation of June 3, 1896, will be in preservation of the improvement.

There seems to be no commerce whatever at present on this portion of the river; the small stern-wheel steamer formerly running the river was taken off in 1895.

The total amount expended on the improvement of this river up to June 30, 1896, is $15,750, of which $5,087.51 was in preservation of the improvement. No work has been done on this river since 1895.

There was expended on the preservation of this improvement during the fiscal year ending June 30, 1897, $207.

Money statement.

July 1, 1896, balance unexpended	$500.00
June 30, 1897, amount expended during fiscal year	207.00
July 1, 1897, balance unexpended	293.00
Amount (estimated) required for maintenance of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	1,000.00

The following appropriations have been made:

By act of—	
July 5, 1884	$2,500
August 5, 1886	2,250
August 11, 1888	5,000
September 19, 1890	5,000
July 13, 1892, maintenance	500
August 18, 1894, maintenance	500
June 3, 1896, maintenance	500
Total	16,250

There was no commerce on this river during the fiscal year.

Q 12.

IMPROVEMENT OF BOGUE CHITTO, LOUISIANA.

An examination of this river was made by direction of act of Congress of August 11, 1888, and report thereon submitted June 24, 1889.

The original project was to close the west mouth and to remove snags, logs, overhanging trees, and fish traps from the east mouth up to Alford Bridge, a distance of 190 miles, so that the river could be used by small river steamers the greater part of the year, at an estimated cost of $55,000.

The following is a statement of the total work performed up to June 30, 1896:

Snags pulled and removed		5,343
Stumps cut, leveled, and removed		381
Logs on banks cut up		243
Overhanging trees felled, pulled, and removed		10,797
Bushes cut		11,106
Drift piles removed		45
Sand removed at east mouth	cubic yards	156
Willow mattresses made and sunk		1,162
Piles cut for jetties and sunk		59
Brush cut for jetties	cords	200
Clay and sand dug and wheeled to jetties	cubic yards	3,623
Banks protected (brush)	linear feet	300

Work under the new appropriation of June 3, 1896, was resumed at the mouth June 10, 1897.

The following is a statement of work performed during the fiscal year ending June 30, 1897:

Snags pulled and removed		30
Gravel and sand excavated	cubic yards	58
Stumps removed from river		32
Logs removed from river		8
Logs cut up, blasted, and removed from banks		19
Overhanging trees felled, pulled back, cut up, and removed		93
Bushes cut (estimated)		655

The work done has resulted in giving a 3-foot channel, according to the project, from the east mouth up to Purvis Lake, a distance of 36 miles. The sand bars at the mouth have been removed. The river, for a distance of 1¼ miles from the mouth up, has been widened from 20 to 50 feet, and deepened to 5 feet, so as to allow light-draft boats and large rafts of logs and timber to pass without trouble at a slight rise above low water. The west mouth has been partially closed.

The total amount expended on the improvement up to June 30, 1896, is $14,983.21, of which $564.60 was in preservation of the improvement.

The total amount expended on this improvement up to June 30, 1897, is $16,223.42.

Money statement.

July 1, 1896, balance unexpended	$5,016.79
June 30, 1897, amount expended during fiscal year	1,240.21
July 1, 1897, balance unexpended	3,776.58
July 1, 1897, outstanding liabilities	76.04
July 1, 1897, balance available	3,700.54
Amount (estimated) required for completion of existing project	35,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	10,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

The following appropriations have been made:

By act of—	
September 19, 1890	$5,000
July 13, 1892	5,000
August 18, 1894	5,000
June 3, 1896	5,000
Total	20,000

COMMERCIAL STATISTICS.

Articles.	1897.	1896.
	Tons.	*Tons.*
Saw logs and timber (pine)	6,720	6,750
Saw logs (cypress)	60	.....
Total	6,780	6,750

Q 13.

SURVEY OF CANAL FROM BIRMINGHAM, ALABAMA, TO THE WARRIOR RIVER, ALABAMA.

The charge of this survey was assigned to me by Department letter dated June 10, 1897. On June 26, 1897, I drew up a project for this survey and forwarded to the Chief of Engineers. It is expected that the survey will begin early in the next fiscal year.

Q 14.

PRELIMINARY EXAMINATION FOR CANAL TO CONNECT THE BLACK WARRIOR RIVER AND FIVE MILE CREEK, ALABAMA, VIA VALLEY CREEK.

[Printed in House Doc. No. 77, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 7, 1896.

SIR: The river and harbor act of June 3, 1896, provides for a preliminary examination, as follows:

Beginning at a point at or near the site selected for Lock Numbered Thirteen on the Warrior River, and continuing up Vally River from its mouth, following the general course of said stream to Bessemer, Alabama; thence up the valley to Birmingham and beyond to Five Mile Creek, at a point where sufficient head can be obtained to supply water for that part of said canal between Five Mile Creek and Bessemer, Alabama. Said channel to have a minimum depth of six feet and be at least fifty feet in width at the water line.

The duty of making this examination was assigned to the charge of Maj. W. T. Rossell, Corps of Engineers, and I have the honor to submit the accompanying copy of report, with map,* upon the subject by that officer, dated November 28, 1896.

Major Rossell states that it is impossible to determine even the feasibility of this improvement except by a thorough and detailed survey,

*Not reprinted. Printed in House Doc. No. 77, Fifty-fourth Congress, second session.

and that under these circumstances he is unable to report this improvement as either worthy or unworthy; but in view of the magnitude of the interests involved he recommends that a careful survey be made, after which a report can be submitted and the worthiness of the improvement determined.

I concur in the views of the local engineer and recommend that provision be made for a careful survey of the locality, estimated to cost $15,000.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., November 28, 1896.

GENERAL: The river and harbor act of June 3, 1896, requires a preliminary examination, as follows:

> Beginning at a point at or near the site selected for Lock Numbered Thirteen on the Warrior River, Alabama, and continuing up Valley River from its mouth, following the general course of said stream to Bessemer, Alabama; thence up the valley to Birmingham and beyond to Five Mile Creek, at a point where sufficient head can be obtained to supply water for that part of said canal between Five Mile Creek and Bessemer, Alabama. Said channel to have a minimum depth of six feet and be at least fifty feet in width at the water line.

I was charged with the duty of making this examination by Department letter of July 31, 1896.

For many years it has been the hope of the citizens of Birmingham to get water transportation for her coal and iron to tide water. The route given is one of several that have been thought of. In general terms three lines have been proposed: one, to the Tennessee River, thence by the Mississippi to New Orleans; two, to the Coosa River, and thence by the Alabama to Mobile, and, three, thence to the Warrior River, and thence by the Tombigbee to Mobile.

I am not called upon to discuss the relative advantages of the different routes by which Birmingham can be connected with tide water.

The immense deposits of coal and iron at and near Birmingham are so well known that it seems unnecessary to go into any details as to their amount, and already have some small shipments of Birmingham pig iron been made from Mobile to Great Britain. This iron was brought to Mobile by rail. Coal is also brought by rail from this section to Mobile in large quantities. It seems safe to assume that there will be heavy shipments by this canal if it is built by the General Government and thrown open to traffic.

I inclose herewith a sketch of Jefferson County, Ala., on which is shown the route proposed for this canal and a supplementary route by Village Creek. The two routes were examined by Messrs. John A. Milner and Julian Kendrick, civil engineers, the latter city engineer of Birmingham, in February, 1896. I append a copy of their report made to the mayor of Birmingham, Mr. J. H. Van Hoose. I agree with these gentlemen that the route by Valley Creek is, so far as can be determined by a preliminary examination, the preferable one.

In considering this project I have found that the difference in level of the mouth of Valley Creek and Birmingham is about 400 feet. There are no exact data on this point. The distance by the route laid down is from where the reservoir must be made, near the head waters of Five Mile Creek, to Birmingham, about 7 miles, and from Birmingham to mouth of Valley Creek, about 36 miles. The country from Bessemer to the Black Warrior is broken and rocky, and in changing the levels of the canal it may be economical to use pneumatic lifts instead of locks. Between Birmingham and Bessemer the route lies in the valley, but a good portion of the cuts seem to be through rock. From Birmingham to the proposed reservoir the route still lies in this valley, cut in places by lateral depressions, across which the canal would have to be partially in fill. At the head waters of Five Mile Creek there is a basin, to inclose which would require only a short dam.

To determine whether this reservoir would be sufficient to feed the canal through the dry season it would be necessary to accurately determine its size and the amount of water that could be relied upon from the springs forming the creek. By the courtesy of Mr. Milner, engineer of the Birmingham waterworks, I was informed that the outflow of Five Mile Creek at the point where the dam would be built is from 3,500,000 to 4,000,000 gallons per twenty-four hours. Practically all of this is now being used as a portion of the water supply of Birmingham. The water is brought to the city in an open canal, except where the line crosses the lateral valleys, and these are crossed by 48-inch mains on trestles. The water company at one time intended to impound this water by a dam, but gave it up and intend to get their entire supply from the Cahaba River. Their reason for abandoning Five Mile Creek was due in part, I am informed, to the uncertainty as to cost and efficiency of the reservoir. I examined their canal at several points and found it through rock.

At the pumping station the level is given to me as 30 feet below the Union Depot.

It may be necessary to take the route of the canal across the valley and along the side of the ridge west of North Birmingham to avoid heavy cuts and excessive land damages. Under any circumstances the line will cut railroad lines now in existence, and such crossings, with possible changes in grade of railroads, must be paid for. In fact, I am satisfied that it is not only impossible to determine the cost of the project, but even its feasibility, except by a thorough and detailed survey. Under these circumstances I am unable to report this project as either worthy or unworthy. In view of the magnitude of the interests involved, I recommend that a careful survey be made, and I estimate that it will cost $15,000. After this survey a report can be made and the worthiness of the project determined. This will not delay the work, should it eventually be undertaken, as the Black Warrior River is not navigable to the mouth of Valley Creek, nor has any project for making it navigable been approved by Congress. At present the approved project extends from Tuscaloosa to the mouth of Daniels Creek. The distance from Daniels Creek to Valley Creek by the Black Warrior River is about 30 miles, and the difference in level at low water about 75 feet.

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major, Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 2, 1896.

Respectfully submitted to the Chief of Engineers, U. S. A.

The district engineer states that he is "unable to report this project as either worthy or unworthy," except as a result of a thorough and detailed survey, which is estimated to cost $15,000. As I understand the law, a survey can not be made until it is authorized by Congress.

* * * * * * *

Under the circumstances I am unable to form an opinion as to the worthiness of the Warrior River, or to make any recommendations.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

LETTER OF MESSRS. JOHN A. MILNER AND JULIAN KENDRICK.

BIRMINGHAM, ALA., *February 27, 1896.*

DEAR SIR: Having been commissioned by you to examine the territory lying between this city and the Warrior River, and to ascertain whether the waterways and resources of this section would seem to justify the necessary outlay for making surveys and estimates of cost of constructing slack-water navigation through that district, we submit the following report:

We have examined two routes, the first beginning at a point on Five Mile Creek in or near section 33, township 16 south, range 2 west, and diverting the waters of Five Mile Creek into Village Creek near North Birmingham; thence down Village Creek to its junction with the Warrior River. This route would be about 27 miles in length.

The second route examined would begin at the same point, connecting the waters of Five Mile Creek and Village Creek as in the first route, then follow down Village Creek Valley to a point nearly opposite Thomas Furnaces, where it would cut through the divide into Possum Valley; thence down Possum Creek to Valley Creek; thence down Valley Creek to its junction with the Warrior River, being about 40 miles in length. Both of these routes for the greater portion of their way pass through rolling, wooded country.

The first route, however, while the shorter, does not pass as close to so many of the furnaces as the second, and passes through a somewhat more broken country, and has the additional disadvantage of passing through the same territory that is now being developed by the Kansas City, Memphis and Birmingham Railroad, at no point being a greater distance than 3 miles from it; while the second route passes almost by the door of many of the furnaces and within 2 miles of 22 of the 25 blast furnaces now in the county, and within easy reach of a large majority of the principal coal mines of the county, and for the lower 15 miles of the route through one of the finest coal fields in this district, which has at present no means of transportation, and is consequently totally undeveloped.

From the most reliable information gained from residents along the two routes examined, and from former observations, we are led to believe that sufficient water can be obtained throughout the entire year, provided Five Mile Creek and Village Creek are united. But especially would this be true of the second route, where the waters of the three creeks are brought together.

The reports of the State inspector of mines show that in Jefferson County the following amounts of coal have been mined and coke manufactured during the past three years:

Year.	Coal mined.	Coke manufactured.
	Tons.	*Tons.*
1893	3,133,538	945,047½
1894	2,776,302	874,071
1895	3,724,231	1,255,878

Reliable information also shows the following to be the amount of iron manufactured in Jefferson County for the past three years:

Year.	Iron manufactured.
	Tons.
1893	599,074
1894	626,175
1895	822,269

We therefore conclude that, taking into consideration the additional tonnage that would naturally be developed along the line of the proposed waterway, and the apparent ample water supply, the outlay for making surveys and estimates of cost would be entirely justifiable.

We would also respectfully call your attention to the fact that this waterway, if constructed, would be along the route so often spoken of to connect the waters of the Tennessee and Warrior rivers, the northern terminus on Five Mile Creek being about 60 miles southwest of the McFarland survey made by the United States Government some years ago to connect the waters of the Tennessee and Coosa rivers.

On the accompanying map of Jefferson County you will find the two routes marked in blue.

Respectfully submitted.

JOHN A. MILNER.
JULIAN KENDRICK,
City Engineer.

Hon. J. A. VAN HOOSE,
Mayor of Birmingham, Ala.

Q 15.

PRELIMINARY EXAMINATIONS OF SHIP ISLAND PASS, MISSISSIPPI, FOR CHANNEL BETWEEN GULF OF MEXICO AND SHIP ISLAND HARBOR. AND FOR DREDGING CHANNEL TO CONNECT SHIP ISLAND HARBOR WITH GULFPORT.

[Printed in House Doc. No. 84, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report of November 19, 1896, by Maj. William T. Rossell, Corps of Engineers, of the results of preliminary examinations of Ship Island Pass, Mississippi, with a view to obtaining a channel 26 feet deep at low tide in said pass between the Gulf of Mexico and Ship Island Harbor; also to dredging a channel 500 feet wide and 25 feet deep to connect Ship Island Harbor with a railroad pier at Gulfport. These examinations were made to comply with provisions contained in the river and harbor act of June 3, 1896, and Major Rossell, for reasons given, is of opinion that the localities are not worthy of improvement by the General Government. His views are concurred in by Col. Peter C. Hains, Corps of Engineers, division engineer, and by me.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., November 19, 1896.

GENERAL: In the river and harbor act of June 3, 1896, it is provided that a preliminary examination shall be made as follows:

Ship Island Pass, Mississippi, with a view to obtaining a channel of twenty-six feet depth at low tide in said pass between the Gulf of Mexico and Ship Island Harbor, with a view of dredging a channel five hundred feet wide and twenty-five feet deep to connect Ship Island Harbor with a railroad pier at Gulfport.

The duty of making this examination was assigned to me by letter from the Chief of Engineers, dated June 16, 1896. I inclose herewith a sketch* showing Ship Island Harbor and the railroad pier at Gulfport, with lines to indicate the channel to be dredged to connect them as proposed. The amount of material to be excavated is, in round numbers, 12,000,000 cubic yards, and the dredging will cost, including inspection, engineering expenses, etc., probably about 10 cents per yard, making the cost of the improvement $1,200,000.

The material to be excavated is in great part a very soft mud, which will move under the action of storms and currents. The prevailing currents are not parallel to the proposed cut, and fills of uncertain amount will take place. It will therefore be necessary to work continuously to retain the channel. Vessels using the channel and lying at the railroad pier to load will be exposed in southerly and southeasterly gales. If the harbor is to be used at all times, it will be necessary to build or construct an artificial harbor by means of breakwaters.

It will be seen that not only will the dredging of the channel be expensive in the first cost and to maintain, but will not reach a harbor at Gulfport.

Is there, then, enough commerce to justify dredging and maintaining a channel?

A report was made on a similar proposed improvement by my predecessor, Maj. (now Lieut. Col.) A. N. Damrell, Corps of Engineers, in 1889, and printed in the Annual Report of the Chief of Engineers for that year (Part II, p. 1460). At that time Major Damrell reported the harbor as unworthy of improvement. The only change that has taken place in the situation is the building of the Gulf and Ship Island Railroad from Gulfport to Hattiesburg, Miss., a distance of 70 miles. The road runs through and taps a fine pine-timber country. In going over the railroad I counted eleven sawmills, constructed or in construction. The expectations of the builders of the road are that a large business in export and import will come, but the road has just been finished, and, so far as I understand, but one cargo has been taken from the pier. This was, I understand, floated to Ship Island Harbor. Any improvement made as provided for in this examination would be largely for the benefit of this railroad. The road owns the pier and all riparian rights for one-half mile on each side of it.

In view, then, of the cost of the work and its maintenance and the fact that there is no present commerce, I feel compelled to report this harbor is not worthy of improvement. There is also provided for a preliminary examination for a channel 26 feet deep at low tide in Ship Island Pass. I have drawn on the sketch such a channel 500 feet wide

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* Not printed.

and 2,000 feet long. The material to be moved is sand and the position is exposed. I feel justified in saying that the improvement will not be permanent. For this reason, I am of the opinion that this channel is not worthy of improvement.

Respectfully submitted.

WM. T. ROSSELL,
Major of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 28, 1896.

Respectfully submitted to the Chief of Engineers, United States Army.

In my opinion the present and prospective demands of commerce at Ship Island, Mississippi, are such that it is not worthy of improvement by the United States.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

LETTER OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., November 28, 1896.

GENERAL: I have the honor to forward herewith copy of letters of S. S. Bullis, W. H. Hardy, and Charles B. Galloway, in reference to proposed improvement of Ship Island Pass and connection, by dredging, of Ship Island Harbor with a railroad pier at Gulfport.

These papers were not received in time to accompany my report of November 19, 1896, on examination authorized by act of June 3, 1896.

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major, Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

LETTER OF MR. S. S. BULLIS.

GULF AND SHIP ISLAND RAILROAD CO.,
OFFICE OF THE GENERAL MANAGER,
Gulfport, Miss., November 21, 1896.

MY DEAR MAJOR: The press of business in connection with the completion of the construction and the organization for operation of our road has been such as to absolutely forbid, on my part, the compilation of the data that might be set forth in answer to your letter of October 16.

But I would call your attention to the fact that Ship Island Harbor, despite its location at a distance from shore, has had for many years a large tonnage from the State of Mississippi, lightered to it from out the different creeks and bays along the coast, made up largely of timber and lumber that will in time be exhausted at these sources, yet it is still itself of sufficient importance and magnitude to warrant the

Government in deepening and improving the channel between the Gulf of Mexico and Ship Island Harbor, regardless of the tonnage that will be made tributary to it by our railroad, and as to that, and whether or not this place is worthy of improvement by dredging a channel 500 feet wide and 25 feet deep, to connect with our railroad pier at Gulfport, I beg to submit the following facts and information:

This railroad is now practically completed to Hattiesburg, 70 miles, and on December 1 will be fully opened for business. It is projected and survey has been made to Pontotoc, Miss., and from there north via a connection which has been built into the State of Tennessee, 62 miles, under the name of the Gulf and Chicago. The entire line we have built and most of that projected is through a virgin country; for the first 100 miles or more through a yellow-pine district, and north of that through oak and other valuable hard woods, for all of which there is a constant foreign demand, besides the good market along the upper Atlantic coast in the United States; and its best outlet, and the only one of profit, is by this harbor at Ship Island, and without an improvement being made so it can be utilized the whole section of the country, from 300 to 400 miles long and from 50 to 75 miles wide, will remain undeveloped for an indefinite period of time, while, on the other hand, with the facilities of railroad and harbor, it is capable of being and will become one of the richest portions of the United States.

With this channel dredged and improvement made, the building of the railroad through the State and the construction of sufficient docks and terminals is assured; and the work already completed should be sufficient evidence of good faith and ample guaranty that it will be done.

Commerce present and prospective. As to what has been in former years, the Government records can give you the best information. As to the immediate present, I would say that more freight than we can transfer to the vessels from the end of the track is being offered us for export in the few days we have been receiving any freight whatever; 1,000 tons per week is being given us by connecting lines, all for shipment by vessel from this harbor, and this is but very small part of what we will get from this source alone; and as to freight for export originating along the line of our own railroad, it has not yet had time to develop, but will be large. There are eighteen sawmills now being erected on the line of the road and more in contemplation, many of them large ones, the combined output of which will equal the present shipments of lumber from Ship Island Harbor, and the total tonnage that this railroad will command for export can conservatively be expected to quadruple the business at this harbor, without further extension of this railroad north of its present terminus, but with the scheme of the railroad carried through to completion, as it will be with harbor facilities, a shipment through this port will follow second to none on the Southern coast.

It goes without saying that a line of railroad traversing a fertile country, through the best section for cotton and passing over vast coal fields and iron ore, and reaching out to the grain fields, will develop a large business in that line. In reality, this is the only business in prospective, and that must necessarily remain so until facilities have been established for a sufficient time for development.

The timber and lumber is waiting at the present time and the whole country suffering and being retarded in growth and development on account of it.

At my request Capt. W. H. Hardy, of Meridian, Miss., former president of this company, and at the present time State senator from his district, addresses a letter to you on this subject, which I hand you herewith, together with a copy of the letter from Bishop Galloway he refers to.

In conclusion, I beg to assure you that the business and representative men of this section of the country tributary to this harbor all agree with me that this project is worthy of Government aid, and I trust you will come to the same conclusion.

Very truly, yours,

S. S. BULLIS, *General Manager.*

Maj. WM. T. ROSSELL,
Major of Engineers, U. S. A.

LETTER OF HON. W. H. HARDY.

MERIDIAN, MISS., *October 29, 1896.*

DEAR SIR: Mr. S. S. Bullis, of Gulfport, Miss., forwarded to me a copy of your letter of the 16th instant, addressed to him in reference to the improvement of Ship Island Harbor, and requested me to furnish such information to the inquiries therein made as might occur to me.

In the first place, it is the deepest and safest harbor on the coast of the Gulf of

Mexico. An examination of the Coast Chart, No. 190, of Mississippi Sound will demonstrate this fact. Cat island, Ship Island, Horn Island, and Round Island, as shown on the chart, form a series of breakwaters that so completely protect the sound from storms that no vessel of seagoing build or capacity has ever been lost in the sound from the time it was discovered by De Iberville, in 1698, to the present time.

But this is not all; there is a good roadstead outside of Ship Island formed by Chandeleur Island. A ship or any number of ships approaching Ship Island Pass in a storm can find ample sea room and depth of water outside, and protected by Chandeleur Island, that furnish good anchorage and enable them to ride out any storm in safety.

Ship Island Pass.—The pass between Ship Island and Cat Island has some superior advantages for improvement that I desire to call your attention to. In the first place, there is no bar—that is, no bar of sand or silt—but a firm, hard bottom. It is true the chart shows a little blue mud, and in places a little white sand and shells, but the current is so strong that the main channel is kept practically clean, and, in my opinion, if the channel is dredged to 26 feet it will never shoal. In the second place, there is in the pass no ground swell as at Pensacola, Mobile, New Orleans, and Galveston. I mean the Gulf entrance to these ports. This is attributable to the fact that the undertow or ground swell of the sea is broken by Chandeleur Island; hence a vessel can safely pass in and out of this harbor loaded down to the depth of the pass, as there is no danger of bumping, the perturbation being at the top and none at the bottom of the sea. This is a most important fact, and its existence can be attested by every ship captain who has navigated this pass for fifty years.

The anchorage inside.—As to the anchorage inside of Ship Island, the chart shows it is scarcely surpassed by any in the world. It is perfectly protected from storms, let them come whence they may. The greatest storm that has occurred on this coast for fifty years was the great hurricane of October, 1893, that wrought such destruction on the coasts of South Carolina and Georgia and on the entire Gulf Coast, but especially south of New Orleans and along a portion of Mississippi Sound, yet eight ships riding at anchor in Ship Island Harbor rode out the storm with but little damage, and that was done to the rigging and masts.

At the last session of the Mississippi legislature a joint committee was appointed to visit the coast and examine the harbors with a view to their improvement. Bishop C. B. Galloway, of the Methodist Episcopal Church South, a man of international reputation and of great learning, and who has but recently returned from a voyage around the world, in which he had the opportunity to visit the great harbors of the leading nations of the world, was invited to accompany the committee as its guest, and on his return, by request of the chairman, wrote his opinion of Ship Island Harbor, and it was read to the senate and adopted and ordered to be spread upon the journal. I append hereto a copy of this letter of Bishop Galloway, taken from the senate journal, and ask for it that careful consideration which such a paper on so important a subject from so eminent and distinguished a man deserves.

Dredging a channel to Gulfport.—Upon the subject of dredging a ship channel to connect the deep water of the harbor with the railroad pier at Gulfport, there is but a single question involved, and that is, Will the channel shoal after it is constructed? The cost of dredging the channel 500 feet wide and 25 feet deep is a bagatelle compared to the benefits thereof if it will not shoal. I think a careful examination of the subject will lead us to the conclusion that it will not shoal. In the first place, we must look to the general conformation of the bottom of the sound and the character of the material forming it. These satisfactorily determined, the question of shoaling is of easy solution. I remark here that there is no sand beyond three-fourths of a mile from the shore, and no sand drifts except near the shore, and these are insignificant. The bottom of Mississippi Sound is overlaid with a soft blue mud, ranging from 1 to 10 feet in depth. It is a soft, putty-like consistency, with a cohesion among its particles that does not rise and fall with the tide or change its position or wash under heavy seas—is never banked up. Underlying this is a stiff blue clay that is not subject to erosion or caving or sloughing. It is difficult to penetrate it with a pile under the blows of a powerful steam hammer. A channel constructed with proper slopes to the banks through this material will never fill up, and the proper slope, in my opinion, is that which nature adopted in the conformation of the bottom of the sound, which is beginning of the north shore at 0 and with a gradual descent for 8 miles to 25 feet. A channel constructed with the same slope to its banks as we find in the bottom of the sound can not shoal or fill up. In proof of this I call your attention to what is popularly known as the "Hole," a few miles west of Gulfport and opposite Pitchers Point, as shown on chart No. 190, before referred to. Why does not this "Hole" fill up? Yet there is a better reason than any that is apparent why the dredged channel will not shoal, because it will be constructed on the line of a current that will take out to sea all soft material that may drift into it. I again refer you to the chart, and state for your information that there are two cur-

rents, one coming between Ship and Cat islands and flowing nearly due north, the other flowing nearly due west along or parallel to Ship Island. These two currents strike each other nearly at right angles opposite the west end of Ship Island, the effect of which is to merge the two into one, but deflected to the northwest. Now, look at the chart and you will see a channel has been scoured by these united currents in the course of time toward the shore opposite Gulfport, and from soundings which I had made a few years ago it was disclosed that the 3-fathom line has been moved near a quarter of a mile toward the shore since 1848, the date of the first chart. Why does not the natural channel, as shown on the chart, shoal or fill up? Whatever may be the reason, the same reason will apply to an extension of this channel by artificial means to the shore or to the point where the sand drifts cease, or to the end of the railroad pier.

The present and prospective demands of commerce.—This branch of the subject is attended with less difficulty and is more pleasing. The present demands of commerce are easily ascertained by an examination of the records of the custom-house at Shieldsboro, where the number of vessels entering the harbor, their tonnage and character, and value of their cargoes, can all readily be arrived at; and if you desire, I can have a tabular statement of these facts made up for you by the collector of the port within a reasonable time, showing the business, say for two years back, though I dare say a request from you for that information would be more readily complied with and at less expense than if made by me. I desire, however, in advance to say that the business done in the harbor will afford no fair criterion of what it would be if there were facilities for receiving and delivering cargoes from and on shore. You must remember that for two hundred years every ship that has attended this harbor has come in ballast, because there is no means of delivering cargoes on shore, and the sole business has been confined to timber and lumber, because it could be lightered there in barges, etc. This timber and lumber is lightered from Gainesville, Logtown, and Pearlington, on Pearl River, and from Handsboro, Scranton, Mosspoint, and hitherto from Mobile. A few years ago Mobile lightered 50,000,000 feet of timber to Ship Island Harbor for loading, for lack of depth of water at Mobile. The president of the Mobile Chamber of Commerce in his annual address to the chamber in January, 1888, referred to the matter with emphasis, and urged it as a reason why Mobile should have liberal appropriation from Congress for deepening her channel to the Gulf. If there were facilities for getting to the shore at Gulfport, so that cargoes could be handled cheaply, this port would soon become second to none on the entire Gulf in the amount of business done. Mobile has to reach the Gulf by a narrow, tortuous channel about 28 miles long, in which vessels are constantly liable to be stuck on the banks; New Orleans has to reach the Gulf over the Mississippi River, a distance of 110 miles. The extra amount of coal required to bring a steamship from the jetties up the river to New Orleans and take it out to sea again would send that same vessel from Gulfport three days on her voyage. With a ship channel connecting Gulfport with the deep water of the harbor cotton could be exported for $1 per bale cheaper than from any port in the South. Hundreds of millions of feet of lumber could be exported at a saving to the manufacturers of $2 per 1,000 feet over any other port in the South; and the most extensive forests of virgin long-leaf pine in the world to-day are in south and east Mississippi, that are practically of little value because the cost of exporting is so high. The capacity of the sawmills now in operation and in process of construction on the line of the Gulf and Ship Island Railroad, and on the Northeastern, with which it connects at Hattiesburg, and on the Lumberton road, soon to connect with the Gulf and Ship Island Railroad at Bonds Station, is probably two hundred millions or more per annum, over half of which would seek foreign markets if facilities for reaching the ships at Gulfport were afforded.

I call your special attention to the connection of the Gulf and Ship Island Railroad, when completed through the State to Jackson, Tenn., with the great meat and grain producing West and Northwest, and with the inexhaustible coal and iron fields of Alabama and Tennessee, all of which could find a cheap outlet through Gulfport Harbor. Good steam coal could be delivered at Ship Island Harbor to supply the navies of the world at $2.50 to $3 per ton.

In considering the question of the "prospective demands of commerce" we must take into consideration the probable certainty of the early competition of the Nicaragua Canal. In that event, it is reasonable to assume that fifty millions of population south of us will change their commercial relations largely from Europe to this country, and this being the deepest, most capacious, and safest harbor, it would become the center of population, commerce, and wealth. Indeed, the ships of India, China, Japan, Australia, and all the west coast of North, Central, and South America would pass through the Nicaragua Canal into and through the Gulf of Mexico in transit to the United States and Europe, making the Gulf the Mediterranean of the Westeren Hemispher. These ships would need coal—they would need safe anchorage in time of storm. Here they could find both. Coaling stations could be estab-

lished on both Ship and Horn islands that would supply the ships of the world w... good steam coal at the minimum cost. These facts all enter into the question of ... prospective demands of commerce.

Outlet for the production of the Mississippi Valley.—Ship Island Harbor is the nat... outlet for the productions of the great Mississippi Valley, which amount to unt... millions, and which will be doubled in the next decade, and if we project our ca... lations into the future of five decades, or a half century (and that is a brief perio... the history of a nation), the mind is almost dazed with the amount and value of t... productions of the teeming millions that will inhabit this great valley. Where ca... they find a cheap outlet to the markets of the world? Not at New Orleans, for t... city is 110 miles from the Gulf, and it is still problematical whether the jetties can ... maintained at the mouth of the Mississippi River. At this time the people of Ne... Orleans are deeply exercised over the crevasse through Pass a Loutre. Not at Mobile for that city is 29 miles from the Gulf, and reaches it by a narrow, tortuous channe... that must be continually dredged to remove the silt brought down by the river... besides, the upper bay is so narrow that the anchorage ground is too narrow an... limited in extent. Not at Galveston, for the channel to connect her harbor with de... water is exposed to the open sea, and can never be relied upon until protected by a se... wall, built at great expense, for the purpose. Here at Ship Island the harbor is pro... tected by breakwaters built by the Almighty, and is almost in rifle shot of the ope... Gulf, and only needs a ship channel to connect with the shores of Gulfport to meet a... demands of commerce that may be made upon it. But this communication, already ... too long, is intended to do little more than to suggest certain facts and condition... which your own superior knowledge, judgment, and observation will lead you t... pursue, and I am sure you will reach the conclusion that the Government can not us... a like sum of money on any other harbor in the United States, or ever has used a like sum, that would yield more abundant fruit and bring untold blessings to a greater number of people.

One more suggestion in conclusion. Mississippi has no harbor of her own or upon her borders through which to export her products, although she annually exports nearly 1,000,000 bales of cotton and 250,000,000 feet of lumber and timber, to say nothing of naval stores, rosin, turpentine, etc., and cotton-seed meal, oil, and cake amounting to many millions of dollars.

I should be happy to aid you in any way I can in this great matter, which I regard as most important, fraught as it is with possibilities for good of such magnitude to the people of the State of Mississippi and to the whole country.

With best wishes, I am, very truly,

W. H. HARDY,
State Senator, Fourteenth District of Mississippi.

Maj. WILLIAM T. ROSSELL.

LETTER OF BISHOP CHARLES B. GALLOWAY.

JACKSON, MISS., *March 4, 1895.*

GENTLEMEN: As members of the committee appointed by the legislature to visit our seacoast and examine our deep-water facilities, you were kind enough to invite me to accompany you, which invitation was highly appreciated and gratefully accepted. Interested as I am in anything that affects the welfare of my native State, and in sympathy with every enterprise that tends to promote her prosperity, I was anxious to study for myself the problem and prospects for a deep-water harbor. You are now kind enough to ask for an expression of my opinion, based upon the observations made. I regret that the press of other duties did not allow me to accompany you to Horn Island Harbor and the towns on that part of the coast. Since my return, by the aid of maps, charts, accepted soundings, and several elaborate reports of engineers, I have made some further investigations. The result of the same, though necessarily somewhat crude, I give you as requested, but without elaboration.

1. I was greatly impressed with the depth and extent of Ship Island Harbor and its immense advantage to the State of Mississippi if properly utilized. Of course I had read that the English fleet under General Pakenham was sheltered there in the war of 1812–1814, and that during the late war between the States the Federal fleet under Admiral Farragut anchored in that broad and peaceful roadstead. I have seen reports also of the amount of timber shipped therefrom to the ports of the world from the large Pascagoula mills; but historic and published statements failed to impress me as did the sight of 22 large vessels, two or three of them great iron steamers, anchored there one afternoon awaiting their cargoes for the ports of Europe. Ship Island, nature's own breakwater, of 9 or 10 miles in length, forming a perfectly secure

barrier against storms and heavy seas, with a depth of water inside varying 25 to 40 feet, and of sufficient breadth for any number of the largest ships in the world, gives us one of the finest harbors on the planet.

I have recently returned from a trip around the world, and had opportunity of seeing the harbors of all the great nations of the world. With but few exceptions have I seen one naturally equal to the Ship Island Harbor, and not one that at so trifling a cost could be made to yield such ample returns. At Colombo, on the Island of Ceylon, the point of call and transshipment between England and Australia, and at Madras, India, with its vast shipping interests, the only protection from the open sea are artificial breakwaters of stone, constructed at fabulous cost. Here on our coast, and within a few miles of the mainland, we have a landlocked harbor, made by the hand of the Creator, for the commerce of the centuries, and yet almost entirely unappreciated. Had our enterprise equaled our opportunities, and had the whole people followed the leadership of our wisest men from 1836 to 1860, Mississippi would not have contentedly paid tribute to the cities of adjoining States, but would have her own metropolis by the sea and made herself the commercial empire of the South. One has only to glance at the expenses of pilotage, tonnage, wharfage, and extra travel to get into the ports of Mobile and New Orleans to appreciate the great advantage in favor of Ship Island Harbor. Experienced shippers testify that the advantages in favor of our Mississippi seaport would be fully 75 per cent. The figures of insurance companies also in their rates on vessels in all Southern ports are an elegant tribute to Ship Island Harbor.

2. The development of our splendid harbor is vitally connected with the completion of the great railroad enterprise, which has been the too long deferred hope of the people of Mississippi. Indeed, without interior and exterior railroad facilities, in my humble judgment, there is scarcely any need to ask from any source a single dollar for a harbor. The business now being done quite exhausts the possibilities of the limited section contiguous. No freights of any kind will ever pass through the cities of Mobile or New Orleans for shipment from a Mississippi point. The commercial interests of these cities are naturally hostile to the improvement or development of a great port on our coast. Since my return I have read the report of the Committee on Public Lands in the United States Senate, made several years ago, in which occurs this reference to Ship Island Harbor:

"This harbor is located about midway between Mobile and New Orleans. It has large capacity, and at high tide has from 25 to 40 feet of water. The people of Mississippi have long cherished the hope that they might be enabled to avail themselves of the advantages it offers. They have long realized that its development would enable them, through a port on their own coast, to have some share in the commerce based upon their heavy crops of cotton, which they market every year through the ports of other States. The proposed railroad connecting this harbor with the interior of the State would contribute largely to this end. It would also make accessible one of the finest timber regions in the world, which from lack of transportation facilities has been shut out from all markets." And on this well-matured opinion Congressional action was secured excepting certain lands from forfeiture in favor of the Gulf and Ship Island Railroad.

I have read the official report of proceedings of the Deep Water Harbor Convention, called by act of the legislature of Mississippi, and which met in Mississippi City May 31, 1892. Representatives from several States were present. That convention adopted this among other resolutions:

"*Resolved*, That after a full and careful examination by soundings and inspection, we declare that the harbor in Mississippi Sound commonly called Ship Island Harbor is such a deep-water harbor as will meet every requirement of national and international commerce."

That convention also sent a strong memorial to the Congress of the United States, with detailed reports of the soundings taken and the amount of business already being done on the coast, and asked for a liberal appropriation for the improvement of that harbor.

3. *United action is all-important.*—We must be of one mind if large and substantial results are to be secured. The petty but noisy rivalry of local communities and their ardent champions must be ignored. This has been the defect and sad fate of several great enterprises in Mississippi. Vicksburg sat on her majestic hills and saw the Mississippi ruthlessly cut another channel and move 2 miles away, while her citizens were contending over varied and contradictory theories in hydraulics. Some, on the fateful night that the waters rushed with ominous roar through the cut-off, were loudly arguing that it never could occur. The question to be decided by you, as the representatives of the entire State, is, as I understand, what is best for the whole people, and what will largely and most speedily contribute to the commercial prosperity? On that point I hope you will heartily agree, and suggest some wise plan for enlisting the intelligence and enthusiasm of all our citizens.

Unless you are aroused to the vast importance of our deep-water harbor, we can not hope to secure sympathy from the General Government.

I am very hopeful that something practical will result from your investigations. The readiness with which the legislature accepted the suggestion and intrusted you with the responsible mission of reporting on a deep-water harbor, evidences a desire to foster an enterprise so affluent in commercial promise and so prophetic of industrial prosperity. If as an humble citizen I can contribute in any way to this great result, it will be my patriotic pleasure to do so.

Very truly, yours,

CHAS. B. GALLOWAY.

Hons. JAS. T. HARRISON, IRVIN MILLER,
(And others of the committee).

Q 16.

SURVEY OF HORN ISLAND PASS, MISSISSIPPI, AND THE PASSAGE LEADING FROM SAID PASS TO THE ANCHORAGE INSIDE HORN ISLAND, WITH A VIEW TO OBTAINING IN SAID PASS AND PASSAGE LEADING THEREFROM A CHANNEL OF 23 FEET AT LOW TIDE.

[Printed in House Doc. No. 200, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 18, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated December 31, 1896, with map,* by Maj. William T. Rossell, Corps of Engineers, of the results of a survey, made to comply with the provisions of the river and harbor act of June 3, 1896, of Horn Island Pass, Mississippi, and the passage leading from said pass to the anchorage inside Horn Island, with a view to obtaining in said pass and passage leading therefrom a channel of 23 feet depth at low tide.

Major Rossell states that to obtain a channel 300 feet wide and 23 feet deep at mean low water from Horn Island Harbor to the Gulf of Mexico would require the excavation of 410,000 cubic yards of material, at an estimated cost of $102,500. To improve this channel to a width of 300 feet and depth of 21 feet at mean low water would necessitate the excavation of 85,332 cubic yards of material, at an estimated cost of $21,333.

He calls attention to the fact that the location of the bar at Horn Island is subject to frequent changes, and states that this shifting of the bar would prevent a dredged channel from being permanent.

For reasons given in his report, Major Rossell is of opinion that Horn Island Harbor and Pass are not worthy of being improved by the General Government, and Colonel Hains, the division engineer, in forwarding Major Rossell's report, concurs in this opinion.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

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*Not reprinted. Printed in House Doc. No. 200, Fifty-fourth Congress, second session.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., December 31, 1896.

GENERAL: In the river and harbor act of June 3, 1896, it is provided that a survey shall be made as follows:

Horn Island Pass, Mississippi, and the passage leading from said pass to the anchorage inside Horn Island, with a view to obtaining in said pass and passage leading therefrom a channel of twenty-three feet at low tide.

The duty of making this survey was assigned to me by letter from the Chief of Engineers dated September 5, 1896.

I inclose herewith a tracing showing the outlines of Horn Island Harbor and Pass. I have also indicated on this tracing, by shading, the area to be dredged to make a cut 300 feet wide and 23 feet deep at mean low water from the harbor to the Gulf of Mexico. I have also indicated the area to be dredged for a channel 21 feet deep at mean low water. The number of cubic yards to be dredged for a 23-foot channel is 410,000 and for a 21-foot channel 85,332.

The mills at and near the mouth of the Pascagoula River ship their lumber partially by Ship Island Harbor and partially by Horn Island Harbor. The amount of commerce from the Pascagoula River is given in my report* on a survey of the mouth of this river, dated December 28, 1896. The material to be dredged is a mixture of sand and mud and in the proportion of about two parts sand to one of mud. This material packs quite hard and is not easy to dredge.

The position is also exposed, and both of these facts will add to the cost of the work. An examination of this place was made by Lieut. Col. A. N. Damrell, Corps of Engineers, in 1881. (Annual Report Chief of Engineers, 1882, p. 1324.) Colonel Damrell there gives the advantage to be gained by deepening the channel to 21 feet. The advantage is in giving a short tow for material now shipped via Ship Island Harbor from Pascagoula River. Commerce at this place has increased since that time. He also gives the least depth in the pass at mean low tide as 16½ feet. This depth has now increased from natural causes to 19 feet. He estimates the cubic yards to be dredged for a cut 100 feet wide and 22 feet deep at mean low water at 86,000; it is now less than this amount for a cut 300 feet wide and 21 feet deep at mean low water.

While the depths through the pass have changed, the position of the channel has also shifted. The eastern end of Horn Island has receded and the western end of Petit Bois Island has advanced.

On the Coast Survey chart it is noted that "the bar at Horn Island is subject to frequent changes and the buoys are shifted accordingly." If, then, a channel were dredged across the bar it would not be permanent.

From the above I am of the opinion that Horn Island Harbor and Pass are not worthy of improvement.

Estimate of cost of dredging a cut 300 feet wide and 23 feet deep, 410,000 cubic yards, at 25 cents	$102,500
Dredging a cut 300 feet wide and 21 feet deep, 85,332 cubic yards, at 25 cents	21,333

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major, Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

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*Printed in House Doc. No. 211, Fifty-fourth Congress, second session.

Q 17.

SURVEY OF PASCAGOULA RIVER, MISSISSIPPI, COMMENCING AT A POINT IN THE MISSISSIPPI SOUND WHERE THE DEPTH OF WATER EXCEEDS 17 FEET, THENCE TO THE MOUTH OF AND UP SAID RIVER TO THE INTERSECTION OF DOG RIVER, AND THENCE UP DOG RIVER 3 MILES, WITH A VIEW TO OBTAINING A CHANNEL OF 17 FEET AT LOW TIDE ALONG THE LINE OF SURVEY.

[Printed in House Doc. No. 211, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 19, 1897.

SIR: The river and harbor act of June 3, 1896, directs that the Secretary of War, at his discretion, cause a survey to be made and the cost of improvement to be estimated at the following locality, viz:

Pascagoula River, Mississippi, commencing at a point in the Mississippi Sound where the depth of water exceeds seventeen feet, thence to the mouth of and up said river to the intersection of Dog River, and thence up Dog River three miles, with a view to obtaining a channel of seventeen feet at low tide along the line of survey.

The duty of making this survey was assigned to the charge of Maj. William T. Rossell, Corps of Engineers, and I now have the honor to submit the accompanying copy of report of December 28, 1896, by that officer, giving the results of the survey thus provided for.

Major Rossell estimates that to obtain a 17-foot channel from 3 miles above the mouth of Dog River to the 17-foot contour in Mississippi Sound, with widths of 150 feet above the railroad bridge at Scranton and 300 feet below that point, would require the excavation of 2,625,555 cubic yards of material, which it is estimated will cost $1,050,222.

He states that the permanency of the dredged channel below the railroad bridge at Scranton is still an open question, and recommends that the channel be first dredged to a depth of 12 feet; after this is done and such depth is found to be reasonably permanent, then to increase the depth to 17 feet.

In conformity with this recommendation he estimates that to obtain a 12-foot channel from 3 miles above the mouth of Dog River to the 12-foot contour in Mississippi Sound, with widths similar to those provided in the previous estimate, would require the excavation of 669,000 cubic yards of material, at a cost of $267,600.

In forwarding the report to this office, Col. Peter C. Hains, Corps of Engineers, the Division Engineer, concurs "in the views of the district engineer that the mouth and lower part of Pascagoula River are worthy of improvement to the extent of a channel 12 feet deep, but no more," it being his opinion that the present and prospective demands of commerce do not justify the Government in incurring the expense of forming and maintaining a channel 17 feet deep.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

HON. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., December 28, 1896.

GENERAL: In the river and harbor act of June 3, 1896, it is provided that a survey shall be made as follows:

> Pascagoula River, Mississippi, commencing at a point in the Mississippi Sound where the depth of water exceeds seventeen feet, thence to the mouth of and up said river to the intersection of Dog River, and thence up Dog River three miles, with a view to obtaining a channel of seventeen feet at low tide along the line of survey.

I was charged with the duty of making this survey, by letter from the Chief of Engineers dated September 5, 1896.

I inclose herewith a tracing* showing the results of the survey and the area to be dredged to carry out the proposed project, viz, a channel 17 feet deep at mean low water. I would recommend making this channel 150 feet wide above the railroad bridge at Scranton, Miss., and 300 feet wide from this bridge to the deep water of Mississippi Sound. The material to be dredged is clay and sand, and most of it will be easy to dredge. The number of cubic yards to be removed is 2,625,555.

The object sought by this improvement is to allow deeper draft vessels to reach the sawmills at Scranton, Moss Point, and vicinity.

The idea of improving or making a channel at the mouth of Pascagoula River is an old one, and we find that Congress appropriated money for this purpose in 1827. Systematic work, however, was begun in 1878. The object sought at that time was to obtain a channel 200 feet wide and 7 feet deep across the bar, which, before the improvement, only had a depth of 3 feet. This project was completed in 1884, and gave a channel 180 feet wide and 7½ feet deep at mean low water.

In 1887 a new project was approved, under an appropriation made by the river and harbor act of August 5, 1886. This project proposed the dredging of a channel 12 feet deep at mean low water, and of "navigable width," through the same portion of the river and bay as is covered by this survey.

Dredging was done in 1887, 1890, 1891, and 1892 on this project under appropriations made in 1886, 1888, 1890, and 1892. The cuts dredged are shown on the tracing herewith. It will be seen that the cuts made in the river have retained their depths, but those in the sound have shoaled. However, as the cut in the sound was not carried beyond the 9½-foot contour, it merely formed a pocket, and shoaling might have been expected to a much greater degree than would have been the case had cuts been made through to the 12-foot contour in Mississippi Sound. The result of this work has been that there is now a channel into Pascagoula River from Mississippi Sound, with a least depth at mean low water of 9 feet, and in the river proper there is a narrow channel 12 feet deep at mean low water.

This improvement has been of value to the river commerce, but to get the full value of it the cuts should be made wider in the river and wider and deeper below the railroad bridge. To dredge a channel 300 feet wide and 12 feet deep at mean low water from the bridge to the 12-foot contour in Mississippi Sound and 150 feet wide and of the same depth above will require the removal of 669,000 cubic yards of material. The material is sand and clay.

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* Not reprinted. Printed in House Doc. No. 211, Fifty-fourth Congress, second session.

If dredging is done at this place there will be trouble to find dumping grounds. For the work south of the railroad bridge the material can be dumped north of Round Island or taken to sea through Horn Island Pass. The material dredged above the bridge must be put ashore, except a small amount that can be put behind Lowry Island and Dog Island. The length of tow to carry material to north of Round Island averages 2 miles, and to tow it to sea averages 10 miles. There are oyster reefs north of Round Island which might be destroyed were much material dumped there. For these reasons I have felt it necessary to estimate the large price of 40 cents per yard for dredging. The price includes all engineering and contingent expenses.

I wrote the mayor of Scranton, Miss., concerning the present and prospective commerce that would be benefited by increasing the depth of water at the mouth of Pascagoula River. His reply is appended to this report.

I also inclose copy of commercial statistics furnished me by collector of customs for last Annual Report.

In view of the large business done at this place now, I am of the opinion that the mouth and lower part of Pascagoula River is worthy of improvement.

The permanency of the dredged channel below the railroad bridge is still an open question, and I would recommend that the improvement be made to obtain a channel 12 feet deep first, and after this is done, if found reasonably permanent, then it be increased to 17 feet.

Estimate for 12-foot channel from 3 miles above the mouth of Dog River to the 12-foot contour in Mississippi Sound, 150 feet wide above railroad bridge and 300 feet wide below bridge, 669,000 cubic yards, at 40 cents.	$267,600
Estimate for 17-foot channel from 3 miles above the mouth of Dog River to the 17-foot contour in Mississippi Sound, 150 feet wide above railroad bridge and 300 feet wide below, 2,625,555 cubic yards, at 40 cents.....	1,050,222

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

STATEMENT OF MR. M. C. ALLMAN, MAYOR, SCRANTON, MISS.

The port of Pascagoula includes the towns of Moss Point, Scranton, East and West Pascagoula, all within a radius of 6 miles and situated on and near the mouth of the Pascagoula River in the county of Jackson, State of Mississippi. These towns are the natural manufacturing point and outlet for 5,000,000 acres of yellow-pine timber, which is floated down the Pascagoula River and its innumerable tributaries, stored along this river, and finally manufactured into lumber and timber, which is shipped to both foreign and domestic ports.

Manufacturing and shipment of lumber is the principal industry carried on in these towns, employing a vast capital invested in sawmills and employed in handling the products of the same.

These mills are all situated in these towns or on the banks of the river above, and are dependent on the Pascagoula River for transportation of their products.

The following counties are the center and heart of the Mississippi pine forest, almost inexhaustible in supply: Jackson, Harrison, Marion, Perry, Jones, Greene, Clark, Wayne, Covington, Smith, Jasper, and Lauderdale, all of which are penetrated by the Pascagoula River or some of its tributaries, and annually furnish about 500,000 saw logs for manufacture into lumber and timber for shipment from the port of Pascagoula, the natural outlet for these products.

In addition to the yellow-pine forests above referred to, there are thousands of acres of rich alluvial bottom lands covered with a heavy growth of different kinds of timber, principally cypress, oak (several species), hickory, beach, ash, and others

too numerous to mention, which will sooner or later become valuable and seek a market.

Under great disadvantages as compared with other lumber ports, this port has increased steadily in the export of lumber and timber, and with liberal appropriation from the General Government and a good draft of water into the Pascagoula River, beneficial results would follow to the Government, the vicinity, the State, and the country at large.

Vessels chartered for the port of Pascagoula drawing 10½ feet of water, loaded, receive their cargoes at the mills in the river.

Vessels drawing over 10½ and under 20½ feet of water loaded are compelled to have their cargoes conveyed to them at Horn Island Harbor by means of barges and tugboats.

Vessels chartered for the port of Pascagoula of a draft exceeding 20½ feet of water loaded are forced to harbor at Ship Island, distant 30 miles from the towns above stated, where the cargoes are manufactured, necessitating the transportation of the lumber and timber that greater distance at great expense and danger to property.

The depth of water in Horn Island Pass is 20½ feet and in Ship Island 21½ feet. This 1 foot difference causes a great number of the larger vessels to receive their cargoes in the latter harbor, as stated above, causing greater expenses to shippers.

Twenty years ago the capacity of the sawmills located at these points was 75,000 superficial feet daily, the product of which sought and received a market only in the city of New Orleans, La., being transported thence in small vessels of light draft, the mouth of the river then having only a depth of about 4 feet.

Under this disadvantage the manufacture of lumber steadily increased, and a small appropriation by the Federal Government was secured, economically expended, and resulted in an increased depth of water. This gave a new impetus to lumber manufacturing, which increased from 75,000 daily capacity of mills, as above stated, to 1,000,000 daily capacity in the present year, demonstrating the need of this industry for deeper water.

The following table shows the commerce of these towns for the year 1896:

Lumber and timber manufactured and shipped, foreign and domestic, through the ports of Biloxi and Pascagoula.

	Quantity.	Value.
Superficial feet	131,873,456	$1,436,040
Lumber and piles creosoted (rail)	2,507,032	67,568
Miscellaneous (by rail and water)	.....	129,380
Total	133,880,488	1,632,988

Total number of vessels entered at port Pascagoula, foreign and domestic, 216; tonnage, 115,322.

The following table shows sawmills located in these towns and on the banks of the river and dependent on the river and harbor for transportation, all of which are in active and permanent operation:

	Number of saw-mills.	Daily capacity.	Located at—
		Sup. feet.	
Dantzler Lumber Co	2	125,000	Moss Point, Miss.
Denny Lumber Co	2	100,000	Do.
Pascagoula Lumber Co	1	100,000	Do.
Moss Point Lumber Co	1	50,000	Do.
Lake Mills	1	50,000	Do.
K. Platt Lumber Co	1	40,000	Do.
Dead Lake Lumber Co	1	30,000	Upper Pascagoula River.
J. I. Dixon & Co	1	40,000	Do.
David Baker	1	20,000	Do.
Patterson, Downing & Co	1	25,000	Do.
J. O. Arve & Co	1	25,000	Do.
F. Gautiers & Sons	1	50,000	West Pascagoula.
M. Parker	1	25,000	Upper Pascagoula River.
Farnsworth Lumber Co	1	100,000	Scranton, Miss.
Mead Bros	1	40,000	Do.
New Venice Manufacturing Co	1	20,000	Do.
Total	18	840,000	

There are also one creosote wood treating plant, five shipyards, the largest of which yards have a hauling-out capacity of from 300 to 500 tons, besides other smaller industries, all of which would be largely benefited by a sufficient depth of water to successfully carry on their respective lines of business.

The foregoing is the business existing at this point at present, employing men and money all over the southern portion of the State in cutting, hauling, and rafting saw logs and square timber, large capital and numbers of men in the manufacture of these products into lumber, a fleet of vessels and their crews transporting the product to distant markets, and a large force of stevedores loading these vessels. All of which would receive great benefit from deeper water into Pascagoula River or Horn Island Pass.

Should deep water be obtained into Pascagoula River, the lumber and timber business above referred to would be doubled, shipbuilding and repairing, carried on now to a limited extent, would be largely increased, and numerous other benefits would accrue in the establishment of other commerce.

There is no reason why mahogany, fruit, or, in fact, anything could not be imported here, or coal, iron, cotton, or anything else.

Respectfully submitted.

M. C. ALLMAN,
Mayor, Town of Scranton.

Maj. W. T. ROSSELL,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

Comparative statement tabulated from information furnished by the United States custom-house for Pascagoula Harbor.

Vessels cleared.	1896.		1895.	
	Number.	Tons.	Number.	Tons.
Foreign	175	98,712	119	93,390
Domestic	41	16,610	144	40,355
Via Ship Island	.....	42,796	.....	.....
Total	216	158,118	263	133,745

Coastwise shipments in 1896 not included in United States custom-house statement.

Articles.	Tons.	Value.
Lumber and timber	10,894	$98,636
Creosoted timber	1,190	23,801
Creosoted piles	2,570	43,767
Rosin	3,000	45,000
Turpentine	600	45,000
Charcoal	4,438	35,500
Wool	13	3,000
Packing cases	180	640
Fruit and vegetable boxes	4	240
Total	22,889	263,574

Q 18.

SURVEY OF SHIP ISLAND HARBOR, IN THE MISSISSIPPI SOUND, TO DETERMINE THE MOST PRACTICABLE ROUTE FROM SAID HARBOR FOR A DEEP-WATER CHANNEL LEADING TO THE MAINLAND ON THE COAST OF MISSISSIPPI.

[Printed in House Doc. No. 252, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 30, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 23, 1897, with map,* by Maj. William T. Rossell, Corps

*Not reprinted. Printed in House Doc. No. 252, Fifty-fourth Congress, second session.

of Engineers, of the results of a survey of Ship Island Harbor, in the Mississippi Sound, to determine the most practicable route from said harbor for a deep-water channel leading to the mainland on the coast of Mississippi, made to comply with the provisions of the river and harbor act of June 3, 1896.

Major Rossell discusses the merits of four localities on the mainland in considering the question of the most practicable route for the channel contemplated. The points considered are: (1) Mouth of East Pearl River, (2) Gulfport, (3) Biloxi, and (4) mouth of Pascagoula River. He states that it is practicable to dredge a channel to any one of the places mentioned, the cost and usefulness of such channel varying within wide limits, according to the route selected. In his opinion the most practicable route for the channel is that leading to Biloxi, as shown on the map. The estimated cost of a channel 300 feet wide and 23 feet deep at mean low water from Ship Island Harbor to the wharves at Biloxi is $812,500. The cost of maintenance would be about $50,000 annually.

Major Rossell remarks at some length upon the advisability of obtaining the channel contemplated by Congress, and he concludes that the interests involved will not now justify the cost of the improvement.

In forwarding the report to this office, the division engineer, Col. Peter C. Hains, Corps of Engineers, concurred in the conclusions of the local officer.

Very respectfully, your obedient servant,

A. MACKENZIE,
Acting Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., January 23, 1897.

GENERAL: The river and harbor act of June 3, 1896, requires a survey as follows:

> Ship Island Harbor, in the Mississippi Sound, to determine the most practicable route from said harbor for a deep-water channel leading to the mainland on the coast of Mississippi.

I was charged with the duty of making this survey by Department letter of September 5, 1896.

Nowhere along the coast of the State of Mississippi is there a deep-water channel from the mainland to the Gulf of Mexico. A fringe of islands about parallel to the mainland and at a distance therefrom of about 10 miles incloses what is known as Mississippi Sound. This sheet of water varies in depth, but is generally shoal not more than 17 feet deep. The passes between the islands form the outlets, and the deepest of these is the one to the westward of Ship Island, called Ship Island Pass.

On the inside of Ship Island there is a deep pocket, which affords an anchorage well protected from Gulf storms. This has a depth of from 21½ to 30 feet at mean low water, and is called Ship Island Harbor. This is an excellent one, and from it a greater part of the exports from the State of Mississippi are sent. The lack of a deep-water channel to the mainland, however, necessitates the lightering of everything except that taken in very light-draft vessels. To avoid this transfer and to load deep-draft vessels at wharves on the mainland, it is desired that a channel be opened to connect this harbor with the mainland.

I inclose herewith a tracing of the Coast Survey chart of Mississippi Sound, and on it I have placed characteristic soundings, taken under my directions, to five points on the mainland. The soundings taken by me agree so well with the Coast Survey soundings that it was not thought necessary to make a more complete survey. These soundings differ but very little except along the sailing line to the easterly entrance to Biloxi Harbor, where the water seems to have deepened.

An examination of the map shows that along the main coast there are four points from which exports are or will be sent under present conditions. These are, first, mouth of East Pearl River;. second, Gulfport: third, Biloxi; fourth, mouth of Pascagoula River.

East Pearl River forms a portion of the boundary line between Mississippi and Louisiana. Along it are sawmills, which ship their lumber partly from Ship Island Harbor by the use of lighters and rafts. I have written to the principal mill owners on Pearl River asking about the amount of commerce, but have received no answer. Once over the bar, at the mouth of the river there is a well-protected harbor, and for a considerable distance there is a depth of more than 26 feet at mean low water.

Gulfport is the terminus of the Gulf and Ship Island Railroad. This railroad is now built to Hattiesburg, Miss., a distance of 70 miles, and is projected through the State to Tennessee, and thence to the Ohio River. The road will be fed from a fine body of pine lands in the State of Mississippi as it is now constructed, and by its prospectus it is hoped that a large business will be built up in carrying articles of export and import. In this connection I would call attention to letters from Mr. S. S. Bullis, general manager Gulf and Ship Island Railroad; Hon. H. Hardy, State senator, fourteenth district Mississippi, and Bishop Charles B. Galloway, of Mississippi, all to be found in my report on preliminary examination of Ship Island Harbor, published as House Document No. 84, Fifty-fourth Congress, second session. The railroad has built a pier at their terminus and purchased all riparian rights for half a mile on each side of it. Gulfport is the nearest point to Ship Island Harbor, but is not a protected harbor. Vessels lying at the pier would be exposed to storms from the south and southeast, and, to make a safe loading place, breakwaters would have to be built.

Biloxi.—This is the largest settlement on the Mississippi coast. The town is one of the oldest settlements of the State. It lies upon a point of land between Back Bay of Biloxi and Mississippi Sound. A sheltered harbor in front of the town is known as Biloxi Bay, and it is protected from southerly and southeasterly storms by Deer Island. Into the Back Bay flow several creeks and rivers, the principal one being Biloxi River. There is considerable trade from this point in lumber, oysters, etc. A branch of the Gulf and Ship Island Railroad has been built to Handsboro, on the Back Bay. The United States has improved the entrance to Biloxi Bay by dredging a channel with a width of 150 feet and a depth at mean low water of 8 feet. If a channel were dredged from Ship Island Harbor to Biloxi, it would be necessary to further improve Biloxi Bay and the channel thereto. The channel heretofore dredged has shoaled, and to make a permanent improvement of Biloxi Bay and its entrance would not only require a large amount of dredging, but also jetties would have to be built to preserve channel. Biloxi Bay, however, while not very large, is well protected.

Pascagoula River, which is the fourth place to which a channel might be dredged, with its tributaries drains a large area in Mississippi and Alabama. Near the mouth of the river are Scranton, Moss Point,

and Pascagoula, making together a community of several thousand people. There is a number of large and small sawmills near the mouth of this river which get their supply of logs from the Pascagoula River and its tributaries. The Pascagoula is formed by the junction of the Chickasahay and Escatawpa rivers, both large and important streams.

The United States has improved the Chickasahay and its tributary, the Leaf, as well as the Pascagoula. The Government has deepened the channel over the bar at the mouth of Pascagoula River to 9.5 feet at mean low water. This work has retained its depth fairly well. If a channel were dug to the mouth of Pascagoula River, it would be necessary to further deepen the channel at its mouth and to do some dredging in the river itself, but the anchorage in the river would be safe and well protected. The language of the law directing this survey is "to determine the most practicable route for a deep-water channel from Ship Island Harbor leading to the mainland on the coast of Mississippi."

It is practicable to dredge a channel to any one of the four points mentioned or to any other point on the Mississippi coast, but the cost and the usefulness of the channel when so dredged will vary within wide limits. Under present circumstances a channel dredged to one of these four points named would be of greater usefulness than if made to any other point. Still, if some other point were selected, a change in the terminus of the Gulf and Ship Island Railroad would probably make the channel to such point of as much use as one dug to Gulfport. In the case of the other points, namely, East Pearl River, Biloxi, and Pascagoula, they would always have the advantage in their protected harbors and the tributary streams. In other words, Gulfport as a harbor is artificial and the other places natural. At the present time, also, the amount of commerce now existing is, I believe, greater at the natural points than at Gulfport.

As to the cost, we must consider not only the first cost but also that of maintenance. In order to fix the cost of this work what is meant by "deep-water channel" must be determined. I have made estimates on the different lines for channels 300 feet wide and with depths at mean low water of 19, 21, and 23 feet. I find the following as approximately the quantities to be removed in each case:

Depth of channel.	From Ship Island Harbor to—									
	(a) End of railroad pier at Gulfport, Miss.		(b) Wharves at Biloxi, Miss.		(c) 7-foot curve entrance Back Bay of Biloxi.		(d) 23-foot curve mouth East Pearl River.		(e) Abreast light-house mouth East Pascagoula River.	
	Length.	Cubic yards.	Length.	Cubic yards.	Length.	Cubic yards.	Length.	Cubic yards.	Length.	Cubic yards.
	Miles.		*Miles.*		*Miles.*		*Miles.*		*Miles.*	
19 feet	7	2,792,533	9	3,537,600	7½	2,068,000	33½	10,612,800	31½	4,620,000
21 feet	9	3,789,866	12	4,857,600	10½	3,212,000	35½	14,719,466	33½	8,492,000
23 feet	11½	5,065,866	14	6,404,566	12½	4,582,966	38	19,104,800	36	12,642,666

From an examination of this table it will be seen that the least yardage is for the channel to the entrance of Back Bay of Biloxi, but the difference between the channels to Biloxi and to Gulfport is not very large—certainly not large enough to determine which channel should be dredged regardless of other facts. The length of the channels to be dredged in these cases varies for a 23-foot channel from 11½ miles at Gulfport to 14 miles at the wharves of Biloxi. In the case of Pascagoula River the yardage varies for the channels of different depths from 4½

millions for a 19-foot channel to about 12½ millions for a 23-foot channel, the length of the channel in the latter case 36 miles. East Pearl River gives a still longer channel and with the greatest yardage of all.

From the above I am of the opinion that East Pearl River is the least practicable of all on account of expense in first cost and also in maintenance, believing that the expense of maintenance will vary nearly with the length of channel.

In the case of Biloxi and Gulfport the cost of dredging will vary with the yardage and the cost of maintenance with the length of channel. This gives the advantage in both cases to Gulfport. However, in the case of Gulfport an anchorage basin must be dredged and a breakwater built, whereas at Biloxi a basin must be dredged and jetties built. These auxiliary works, properly belonging to the improvement of the harbor and not to the channel, I have not considered in detail, but am of the opinion that they will not be very different in expense for the two places.

In the case of Gulfport there is very little, if any, present commerce, while Biloxi has probably a half a million dollars. Under these circumstances I am of the opinion that the channel to Gulfport is less practicable than the one to Biloxi. It will be noticed that two lines have been sounded for Biloxi, one going to the wharves of the town and the other to the eastern entrance only. I will use the one going to the wharves for purposes of comparison, as it requires the greatest yardage and is the longest, and by it shipping will get to the mainland. We have now left to compare Biloxi and Pascagoula River. So far as cost is concerned, the yardage is nearly twice as great for Pascagoula as for Biloxi, and the length of the channel for 23-foot depth is more than two and one-half times as great for Pascagoula as for Biloxi. If we take the amount of commerce, it is probably twice as great for Pascagoula as for Biloxi, as things are at present; but if we add to Biloxi what will come by way of the Gulf and Ship Island Railroad, a branch of which, I understand, is now at Handsboro, on the Back Bay, this difference will be less and will probably in time disappear.

Again, the exports from Pascagoula only partly go to Ship Island Harbor, as Horn Island Harbor is nearer and nearly equally good. It will be noticed that the proposed channel from Ship Island Harbor to Pascagoula goes through Horn Island Harbor. This detour makes the line longer than it need be, but follows the deepest water and gives the use of Horn Island as well as Ship Island Harbor.

From the above I am of the opinion that Pascagoula River channel is less practicable than Biloxi, and, finally, I am of the opinion that the most practicable route for a deep-water channel from Ship Island Harbor leading to the mainland on the coast of Mississippi is the one leading to Biloxi, Miss.

If such a channel were dredged, it would then be necessary to make a basin inside of Biloxi Bay. Further dredging would be necessary to reach the sawmills in the Back Bay of Biloxi.

The currents in Mississippi Sound are due to the tides and storms, and while the contours opposite Ship Island Pass show that the tendency of the current is to keep a deep-water pocket extending toward the mainland, yet if a channel were dug through the shoals, all storms not in the direction of this channel would tend to fill it. I can give no absolute estimate of the cost of maintenance, but I am of the opinion that it will be about $50,000 annually.

The cost of dredging the channel I would estimate at 12½ cents per cubic yard.

Estimate for a channel 300 feet wide and 23 feet deep at mean low water from Ship Island Harbor to Biloxi wharves, 6,500,000 cubic yards, at 12½ cents per yard, $812,500.

The material in the sound, to be dredged, is reported to be, in shoal parts, soft mud, and varying from this to a stiff clay in which there is found a small percentage of sand where the water is more than 19 feet deep.

It is difficult to report as to the worthiness of this work. The State of Mississippi has within her borders Ship Island Harbor, naturally one of the best of the Gulf harbors, and Horn Island Harbor, but little less in depth than Ship Island Harbor. Both these harbors are distant from the mainland about 10 miles and there is no way to connect them with the mainland except possibly at a cost that is prohibitory. On the mainland of Mississippi we find, as above, four shipping points, yet at these points the water is so shoal that freight seeks the ports of neighboring States to avoid rehandling, and yet with all these disadvantages considerable commerce goes from Ship Island and Horn Island harbors. However, all exports, or nearly all, sent from each of these shipping points represent the products of that point. Thus, the Pearl River mills furnish all, or nearly all, exports made from there, and so it is with the other places.

The managers of the Gulf and Ship Island Railroad claim that this road will bring down the products of the interior to Gulfport, and this will make that a shipping point for a larger extent of country. While this may happen in the future, yet, as a fact, what exports might be expected, as things are to-day, would be lumber sawed along the line of the road. At the other points the logs are brought down the water courses and sawed at tidewater. With Mobile Harbor on one side and New Orleans on the other, both improved at great cost, and the fact that if a channel is dredged by the Government to any one of the shipping points on the coast of Mississippi the benefit will be mainly local, I feel compelled to report this channel as not worthy of improvement.

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

Q 19.

SURVEY OF CHANNEL AT MOUTH OF PEARL RIVER, MISSISSIPPI, LEADING TO DEEP WATER IN THE MISSISSIPPI SOUND, WITH A VIEW TO OBTAINING A 17-FOOT CHANNEL AT LOW TIDE.

[Printed in House Doc. No. 206, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 19, 1897.

SIR: I have the honor to submit the accompanying copy of report dated December 23, 1896, with map,* by Maj. William T. Rossell, Corps of Engineers, of the results of a survey of channel at the mouth of

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* Not reprinted. Printed in House Doc. No. 206, Fifty-fourth Congress, second session.

Pearl River, Mississippi, leading to deep water in the Mississippi Sound, with a view to obtaining a 17-foot channel at low tide, made to comply with the provisions of the river and harbor act of June 3, 1896.

Major Rossell submits a plan which provides for a channel 300 feet wide and 17 feet deep at mean low water, requiring the excavation of 758,664 cubic yards of material, at an estimated cost of $227,599.20. For reasons given, he is of opinion that this channel is not worthy of improvement to a greater depth than 9 feet at mean low water. To obtain a channel 300 feet wide and 9 feet deep at mean low water would necessitate the excavation of 60,666 cubic yards of material, estimated to cost $18,199.80. Major Rossell is of opinion that the channel thus obtained would be reasonably permanent.

In forwarding Major Rossell's report to this office, the division engineer, Col. Peter C. Hains, Corps of Engineers, stated as follows:

> I concur in the opinion of the district engineer that this channel is not worthy of improvement to a depth of 17 feet at mean low water, but is worthy of improvement to a depth of 9 feet at mean low water.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. WILLIAM T. ROSSELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., December 23, 1896.

GENERAL: In the river and harbor act of June 3, 1896, it is provided that a survey shall be made as follows:

> Channel at the mouth of Pearl River, leading to deep water in the Mississippi Sound, with a view to obtaining a 17-foot channel at low tide.

The duty of making this survey was assigned to me by letter from the Chief of Engineers, dated September 5, 1896.

I inclose herewith a tracing showing the depths of water found on this bar and by shading, the area to be dredged to give a channel 300 feet wide and 17 feet deep at mean low water. The number of cubic yards to be excavated is 758,664.

East Pearl is the name given to the eastern outlet of the Pearl River. The other, or western outlet, called West Pearl River, empties into the Rigolets. At the place where the main river divides East Pearl River is practically closed to navigation, and all navigation on Pearl River that seeks an outlet goes by way of West Pearl River, except rafts that are brought down for the sawmills on East Pearl River.

Hence, so far as navigation is concerned, the only benefits to be obtained by this proposed channel would be that coming from and going to the sawmills situated on this branch below the junction.

On this stretch of river there are several sawmills, the firm of Poitevant & Favre being much the largest. Much of their output is for export, and is loaded by lightering to Ship Island Harbor and harbors in Louisiana. The bar at the mouth of the river has a depth of 7½ feet at mean low water, but before getting to the deep-water harbors it is necessary to cross other bars over which there is a least depth of about 9 feet at mean low water. The tracing sent herewith does not show

these other bars, but they can be seen on the Coast Survey charts of the localities.

I am of the opinion, therefore, that the mouth of East Pearl River is not worthy of improvement to a greater depth than 9 feet at mean low water. The number of cubic yards necessary to be excavated to give a channel 300 feet wide and 9 feet deep at mean low water is 60,666.

My predecessor, Lieut. Col. A. N. Damrell, proposed to dredge at this place a channel 100 feet wide and 12 feet deep at mean low water. (See Report of Chief of Engineers, 1885, p. 1367.)

He reported that the amount of business warranted this work, and in the river and harbor act of July 13, 1892, $10,000 was appropriated to dredge this channel. This work was advertised and bids opened March 14, 1893. The lowest bid was 27 cents per cubic yard. This bid was rejected, and bids have not again been asked, as it was thought best to wait until further appropriations were made.

I have been unable to obtain any statement of the amount of commerce that would be benefited. However, it is known that a very large business in lumber is done both for export and coastwise trade. In the Chief of Engineers' Report for 1895, page 1327, the amount of lumber shipped on Pearl River for 1894 is given as 52,000 tons, valued at $682,000. All of this, it is understood, came from East Pearl River.

In view of the above, I am of the opinion that this bar is worthy of improvement to the extent of a channel 300 feet wide and 9 feet deep at mean low water.

Estimate, including engineering and incidental expenses, 60,666 cubic yards, at 30 cents, $18,199.80. It is not probable that this channel would be entirely permanent, but as the material is reported as stiff mud I hope that it will be reasonably so.

Estimate, including engineering and incidental expenses, for a channel 300 feet wide and 17 feet deep at mean low water, 758,664 cubic yards, at 30 cents, $227,599.20.

Very respectfully, your obedient servant,

WM. T. ROSSELL,
Major of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

APPENDIX R.

INSPECTION OF THE IMPROVEMENT OF THE SOUTH PASS OF THE MISSISSIPPI RIVER.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS, INSPECTING OFFICER, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORK.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., July 1, 1897.

GENERAL: I have the honor to report upon the improvement of the South Pass of the Mississippi River during the fiscal year ending June 30, 1897.

The work is carried on under the direction of the legal representatives of James B. Eads, deceased, by authority granted them in an act of Congress approved March 3, 1875.

The work done during the year was such only as was required to maintain the works in an effective condition, and was not extensive.

During the year "a channel having a navigable depth of 26 feet" was maintained through the shoal at the head of South Pass. For thirty-seven days, from May 25 to June 30, inclusive, the channel in that part of South Pass known as Grand Bayou Reach did not have the required "navigable depth of 26 feet." This decrease in the depth was caused by sand waves.

For 137 days during the year the channel "through the jetties and beyond them to deeper water in the Gulf" was not maintained "26 feet in depth, not less than 200 feet in width at the bottom, and having through it a central depth of 30 feet without regard to width," as the law requires.

Considering the whole channel from the main river to the Gulf, there were, therefore, 174 days when a legal channel was not maintained.

During the year the dredge boat worked 15 days in South Pass, 90 days in the jetty channel, and 5 days in the channel beyond the ends of the jetties.

The time is approaching when the Government will have to assume control of the maintenance of the South Pass channel. There remain about three years to be covered by the terms of the act relative to the maintenance by the Eads executors, and it is important that some action should be inaugurated at an early date by which the deep-water communication between the Mississippi River and the Gulf be perpetuated. As will appear from this report and preceding ones, a certain amount of dredging has been found necessary throughout the pass, between the jetties and upon the bar in advance of the jetties, to maintain the channel depths. In fact, it is proper to remark that the channel has not been continuous, although extensive dredging has been carried on

at times, and that the full depth required does not at present exist a point in the pass known as Grand Bayou Reach. It is not, therefo to be confidently expected that, without a far greater effort tha possible of execution under the Eads management, the maintenanc the present depth required for any length of time could not be expe without a considerable modification in the controlling dikes and jett and considerable increase in the dredging plant.

The extension of the bar into the Gulf is graphically shown on Pl I, and from this it will be readily seen that the prolongation of the ties is a matter that can not be postponed for a much longer time.

The pilots report a very conspicuous shoaling in the main river ju above the Head of the Passes, and if such should prove to be the ca a very great deal of dredging will be necessary in the river itself maintain a continuous channel between the deep waters of the riv and Gulf.

* * * It is reliably reported that the depth of water is so sca that vessels drawing 23 feet experience a material retardation wh passing over it.

* * * * * * *

If the maintenance is to be carried on without the interposition o contractor, there will be required for the purchase of materials an accumulation of a working plant the sum of $2,000,000, to be expended during the ensuing three years. Then a further sum of $1,000,000 f labor and materials to be used in extension of jetties and modification in dikes and dams and other work which would become necessary upon assuming charge, the modifications being based upon an increase o navigable depth to 30 feet or 32 feet through pass and jetty channel, as may be deemed essential. The annual expense of maintenance owing to the desired increase in depth will have to be placed at not less than $150,000 per year.

The money annually available for the inspection expenses of the jetty channel, etc., is hardly sufficient under present conditions, and should be increased from $10,000 to $12,000. A good deal of extra work has been occasioned by reason of the necessity for determining ratio of discharge of the several passes, and it is reasonable to expect that further work of this kind will be required as the time for the termination of the tenure of the South Pass Jetty Company approaches an end. I would therefore invite attention to the necessity for the increase.

I submit herewith the report of Mr. C. Donovan, assistant engineer, with six charts and three plates to accompany the same.

The following are copies of certified statements which I made during the year upon which quarterly payments were made to the contractors:

United States inspecting officer's certificate for maintenance of channel at the mouth and head of South Pass of the Mississippi River, and also "through the pass itself," as designated by acts of Congress approved March 3, 1875 and 1879.

U. S. ENGINEER OFFICE,
Port Eads, La., Jan'y 28, 1897.

I certify that between the dates of June 29, 1896, and January 28, 1897, both dates inclusive, Estill McHenry and E. M. Switzer, the legal representatives of James B. Eads, deceased, maintained a channel for *three months* "through the jetties" at the mouth of South Pass of the Mississippi River, "twenty-six feet in depth, not less than two hundred feet in width at the bottom, and having through it a central depth of thirty feet without regard to width."

During the same period a channel having "a navigable depth of twenty-six feet" was maintained through the shoal at the head of South Pass, and "through the pass itself."

During the aforesaid period there were 122 days, from August 17 to December 16, 1896, both dates inclusive, when the required channel did not obtain "through the jetties."

Depths were "measured at average flood tide."

JAMES B. QUINN,
Major, Corps of Engineers.

U. S. ENGINEER OFFICE,
Port Eads, La., May 13, 1897.

I certify that between the dates of January 29 and May 13, 1897, both dates inclusive, Estill McHenry and E. M. Switzer, the legal representatives of James B. Eads, deceased, maintained a channel for three months "through the jetties" at the mouth of South Pass of the Mississippi River, "twenty-six feet in depth, not less than two hundred feet in width at the bottom, and having through it a central depth of thirty feet without regard to width."

During the same period a channel having "a navigable depth of twenty-six feet" was maintained through the shoal at the head of South Pass, and "through the pass itself."

During the aforesaid period there were fifteen days during which the required channel was not maintained, as follows:

From February 23 to 28, both dates inclusive, the jetty channel was not "two hundred feet in width at the bottom," and from April 16 to 20, both dates inclusive, it did not have "a central depth of thirty feet." From May 6 to 9, both dates inclusive, the channel beyond the ends of the jetties did not have "a central depth of thirty feet."

Depths were "measured at average flood tide."

JAMES B. QUINN,
Major, Corps of Engineers.

Estimate of funds required for examinations and surveys at South Pass, Mississippi River, during the fiscal year ending June 30, 1899.

1 assistant engineer	$2,700
1 assistant engineer	1,500
1 steam engineer	1,200
1 water-level observer	60
5 seamen	3,320
Rent of office and quarters	300
Mileage and traveling expenses	180
Repairs to launch and boats	500
Supplies for launch and office	240
Contingencies	2,000
Total	12,000

Money statement.

Amount allotted for fiscal year 1896–97 under act of August 11, 1888	$10,000.00
Amount expended during fiscal year	10,000.00
Amount allotted for fiscal year 1897–98 under act of August 11, 1888	10,000.00

Statement of expenditures on account of appropriation for examinations and surveys at South Pass, Mississippi River, for the fiscal year ending June 30, 1897, made in compliance with section 4 of river and harbor act of August 11, 1888.

Amount appropriated by act of August 11, 1888 ..... $10,000.00

EXPENDITURES.

1 assistant engineer, twelve months, at $225	$2,700.00
1 assistant engineer, twelve months, at $125,	1,500.00
1 engineer, launch, twelve months, at $100	1,200.00
1 first-class seaman, eleven months, at $70	770.00
1 first-class seaman, twelve months, at $65	780.00
1 first-class seaman, eleven months, at $65	715.00
1 first-class seaman, ten and one-half months, at $60	630.00
1 water-level observer, six months, at $10	60 00
1 water-level observer, six months, at $5	30.00

1 first-class seaman, five days, at $2.25	$11.25
1 clerk, one and fourteen-thirtieths months, at $75	110.00
Rent of office and quarters, Port Eads, La., six months, at $35	210.00
Rent of office and quarters, Port Eads, La., six months, at $25	150.00
Stationery, etc	14.95
Repairs to steam launch *General Reese*	171.43
Ship chandlery, hardware, etc	145.20
Coal	485.10
Traveling expenses and mileage	185.39
Cypress skiff	24.00
Creosoted piles	100.00
Express charges	4.25
Telegrams	3.13
Total expenditures	10,000.00

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

REPORT OF MR. C. DONOVAN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Port Eads, La., June 30, 1897.

SIR: I have the honor to report for the fiscal year ending June 30, 1897, upon the maintenance of the works constructed for the improvement of South Pass of the Mississippi River, the present condition of the works, and of the channel secured and maintained by them.

The work is carried on under the direction of the legal representatives of James B. Eads, deceased, by authority granted them in an act of Congress approved March 3, 1875.

The following charts and plates accompany this report:

No. 1. Chart of the channel from South Pass Light-House, through the jetties, to deeper water in the Gulf.

No. 2. Chart of a part of the Gulf of Mexico, giving depths out to that of 100 feet.

No. 3. Chart of a part of South Pass from South Pass Light-House to Grand Bayou.

No. 4. Chart of a part of South Pass from Grand Bayou to the Head of the Passes.

No. 5. Chart of the Head of the Passes.

No. 6. Plan and comparative profiles of South Pass.

Plate I. Diagram showing changes in the Gulf for each year from 1876 to 1896.

Plate II. Comparative curves in the Gulf of Mexico.

Plate III. Exhibition of changes due to sand waves in Grand Bayou Reach.

AT THE HEAD OF THE PASSES.

Upper dam.—This dam, which is 535 feet in length, was maintained in good condition during the year. In order to strengthen the east end and destroy the effect of a strong eddy which threatened to cause undermining a spur 41 feet long and 12 feet wide was built on the lower side of the dam at right angles to it and 43 feet from the east end.

The following materials were used in the maintenance of this work during the year: Twenty-nine piles, 193 linear feet of 12 by 12 inch timber, 26 screw bolts, 783 cords of willows, 109 cubic yards of stone, and 4,346 sacks of earth.

West T-head.—Some of the piling in this work was renewed, and it was otherwise strengthened and maintained in fair condition during the year. The following materials were used in its maintenance: One hundred and ten piles, 495 linear feet of 12 by 12 inch timber, 58 screw bolts, 425 cords of willows, and 1,972 sacks of earth.

Cut-off dike.—This work, which extends from the upper dam to the mainland below it, and divides the waters of South Pass and Pass a Lontre, was built in 1895–96. It is in good condition and required no attention during the year.

The location of all works at the Head of the Passes is given on chart No. 5.

IN SOUTH PASS.

Willows weighted with earth in sacks were placed at the shore ends of the four sheet-piling dams which project from the west shore of the Pass below the Head of the Passes Light-House. This was done to prevent the shore from being cut away by the effect of wave action.

These dams were built in May, 1894, and are described on page 1335, Appendix R, of the Report of the Chief of Engineers for 1894.

During the high river Dams 3 and 4 were washed out, except a short distance of each which was embedded in the bank. The waling pieces broke close to the bank and the dams went out without being broken up. Dam No. 2 was threatened, but it was saved by piling and bracing on the lower side.

Four piles, 48 linear feet of 12 by 12 inch timber, 55 cords of willows, and 732 sacks of earth were used in the maintenance of these dams during the year. Nos. 1 and 2 are still in good condition. The locations of all of them are given on chart No. 5.

In Goat Island Reach.—There are five dams in this reach which are being maintained. The four on the east side are in good condition, but the one on the west side has been neglected, as it is considered unimportant at present. Two of these dams were strengthened during the year by the addition of 16 piles, 195 linear feet of 12 by 12 inch timber, 22 screw bolts, and 155 cords of willows.

In Grand Bayou Reach.—There are 12 wing dams maintained in this reach, including one new one, No. 18, which is 37 feet long and 12½ feet wide. The older ones were more or less repaired during the year, and at present 7 of them are in good condition, 4 in fair condition, and 1, No. 16, was recently wrecked by being undermined by the strong current. The following materials were used in maintaining and constructing these dams: Ninety piles, 658 linear feet of 12 by 12 inch timber, 103 screw bolts, 677 cords of willows, 25 cubic yards of stone, and 600 sacks of earth.

Grand Bayou Dam.—The dam which closes Grand Bayou from South Pass was built up for a distance of 126 feet by the addition of 35 cords of willows and 550 sacks of earth. This was done to prevent the escape of water from South Pass at high tide.

At two localities, 1,700 and 3,500 feet below Grand Bayou, the west shore of South Pass was built up so as to confine the water at high tide. This was done by the use of willows and sacks of earth confined between three rows of stakes. In the first instance the area built up was 131 feet long by 12 feet wide, and the second is 224 feet long and 18 feet wide.

The materials used in this work were as follows: One hundred and eighty-five stakes 16 feet long, 157 cords of willows, and 1,350 sacks of earth.
of willows, and 1,350 sacks of earth.

The locations of dams in Goat Island and Grand Bayou reaches are given on Charts Nos. 3 and 4.

AT THE MOUTH OF SOUTH PASS.

All the works referred to at this locality are represented on chart No. 1.

East jetty.—No work has been done on this jetty since 1893.

In 1882 more than one-half of the jetty was apparently secured by the land formation which was gradually accumulating about it, particularly to the eastward of it, but since that time this formation has been receding and disappearing, uncovering the jetty over and about which it had formed and leaving it exposed to the sea. It has receded 3,150 feet since 1882, or an average of 210 feet per year. Several attempts have been made to arrest this recession, but to no purpose. It is still in progress, and 230 feet of the jetty was uncovered during the year.

The condition of the jetty is as follows: For 3,150 feet below East Point, where it begins, it is buried by the land formation. For the next 3,000 feet it is as originally built of mattresses of willows weighted with stone. For 800 feet of this distance the riprap which covers the top mattress is about 1 foot below the present average flood tide, and for the remainder of the distance it is 3½ feet below that plane. The remainder of this jetty is capped by a concrete wall which is built upon the original mattress foundation except for a length of 625 feet, where the original line was deviated from in order to avoid the débris of a previous wall.

With the exception of 304 feet in two sections of older construction, and another of the newer where the foundation was undermined, causing the wall to settle although it was not otherwise displaced, the work is in fair condition.

The average height of this wall above the present plane of average flood tide (3.97 feet on Port Eads gauge) is 0.52 of a foot.

West Jetty.—Five hundred feet of the outer end of this jetty is from 2 to 5 feet below the surface of the water, the concrete work being still in place. The remainder of this work, as is represented on Chart No. 1, is below the surface of the land formation, which has taken place since it was built.

Inner East Jetty.—The upper section of this work, 1,900 feet in length, has for some time been neglected since the land which has formed between it and the main jetty has consolidated to such an extent that it forms a substantial bank.

The work of renewing the channel row of piles, which was begun last year, in the remaining portion of this jetty was continued during the year, and but about 1,500 feet remain to be renewed to complete the work.

Two courses of 12 by 12 inch timber were added to two cribs near the end of this jetty.

Willows and stone were added wherever the work required them most, the quantity of stone being small since that in place is used over and over, being removed when the willows have been compressed and reused when additional willows are placed.

The work is in fair condition and well above the highest tide.

The materials used in this jetty during the year are as follows: Four hundred and ninety-eight piles, 1,162 linear feet of 12 by 12 inch timber, 206 drift bolts, 1,95[illegible] cords of willows, 495 cubic yards of stone.

Inner west jetty.—For a distance of 302 feet below the west light this jetty was built up by cribs 9 feet wide, consisting of three courses of 12 by 12 inch timber added to similar older structures.

The channel row of piles was renewed for a distance of 1,000 feet, which, together with what was done last year, completes the renewal of the piling for a distance of 2,650 feet. Willows and stone were added to the jetty at localities which required them.

This jetty is now 4,800 feet in length and its condition is as follows: For 3,100 feet from the sea end it is in good condition, for 500 feet it is in fair condition, and for 1,200, in two sections, between dams 48 and 11 and 48 and 30, the jetty is below the surface of the water, and the piling has rotted away. There is, however, a firm bank formed along these sections, and it is not deemed necessary to maintain the jetty there at present.

The following materials were used in the maintenance of this jetty during the year: Two hundred and seven piles, 1,071 cords of willows, 263 cubic yards of stone, 3,660 linear feet of 12 by 12 inch timber, and 802 drift bolts.

Wing dams.—Of the 34 wing dams, 17 on either side of the jetty channel which are being maintained, 26 were repaired during the year, and all except three are in good condition. During the month of May a dam, No. 23, was built from the east jetty to the inner east jetty to arrest the flow of water between these structures and the consequent deepening. This dam is 145 feet long and 11 feet wide and consists of two rows of piles 11 feet apart, between which loose willows are placed, and upon the latter a crib 120 feet long and 9 feet wide is built and filled with stone.

The following materials were used in the construction of Dam No. 23, and in the maintenance of wing dams: One hundred and ninety-four piles, 3,177 linear feet of 12 by 12 inch timber, 664 linear feet of 8 by 12 inch timber, 338 drift bolts, 244 screw bolts, 1,520 cords of willows, 42 cubic yards of stone, and 968 sacks of earth.

DREDGING.

From June 22, 1896, to June 21, 1897, both dates inclusive, being three hundred and sixty-five days, the dredge boat was in commission two hundred and thirty-five days, and worked one hundred and ten days of ten hours each, as follows: Fifteen days in that part of South Pass known as Grand Bayou Reach, ninety days in the jetty channel, and five days in the channel beyond the ends of the jetties.

THE PLANT.

During the months of July and August the dredge boat was generally and extensively repaired, and during the year a launch, derrick boat, and four barges were repaired, and 54 mooring piles driven at different localities.

THE FORCE EMPLOYED.

The average force employed during the year, including all grades, was 40 in number.

EXAMINATIONS AND SURVEYS.

The results of examinations and surveys made during the year are tabulated or represented graphically herein, and comparisons with earlier results are made in such a way as to render them readily understood and of special interest, it being my aim to present them in a way at once clear and concise, and without descriptive detail.

In this connection, as it relates to the maintenance of the channel at the Head of

the Passes, throughout South Pass, through the jetty channel at its mouth, and beyond the jetties to deeper water in the Gulf, during sixteen and three-fourths years, I give the following table.

The following table gives the number of days from July 8, 1879, to May 13, 1897, both dates inclusive, during which the required channel was maintained through the South Pass of the Mississippi River, the jetty channel at its mouth, and beyond the jetties to deeper water in the Gulf of Mexico; also the number of days during which said channel was not maintained, and the stage of river during those periods:

Number days during which channel was maintained. (Full quarter.)	Periods which include a full quarter and the number of days during which the channel was not maintained.		Number of days deficiency and locality of same.			Stage of river at Carrollton, La.
	From—	To—	In South Pass.	In Jetty Channel.	In Gulf of Mexico.	
92	July 8, 1879	Oct. 29, 1879	.....	22	.....	2
92	Oct. 30, 1879	Feb. 9, 1880	.....	11	.....	1 to 3
90	Feb. 10, 1880	May 9, 1880	.....	.....	.....	.....
92	May 10, 1880	Aug. 9, 1880	.....	.....	.....	.....
366						
92	Aug. 10, 1880	Nov. 9, 1880	.....	.....	.....	.....
92	Nov. 10, 1880	Feb. 9, 1881	.....	.....	.....	.....
89	Feb. 10, 1881	May 9, 1881	.....	.....	.....	.....
92	May 10, 1881	Aug. 13, 1881	.....	.....	4	12 to 10
365						
92	Aug. 14, 1881	Nov. 13, 1881	.....	.....	.....	.....
92	Nov. 14, 1881	Feb. 13, 1882	.....	.....	.....	.....
89	Feb. 14, 1882	May 13, 1882	.....	.....	.....	.....
92	May 14, 1882	Sept. 9, 1882	.....	14	13	12.5 to 12
365						
91	Sept. 10, 1882	Dec. 9, 1882	.....	.....	.....	.....
90	Dec. 10, 1882	Mar. 9, 1883	.....	.....	.....	.....
92	Mar. 10, 1883	June 9, 1883	.....	.....	.....	.....
92	June 10, 1883	Sept. 9, 1883	.....	.....	.....	.....
365						
91	Sept. 10, 1883	Dec. 9, 1883	.....	.....	.....	.....
90	Dec. 10, 1883	Mar. 9, 1884	.....	.....	.....	.....
92	Mar. 10, 1884	June 9, 1884	.....	.....	.....	.....
92	June 10, 1884	Sept. 9, 1884	.....	.....	.....	.....
365						
91	Sept. 10, 1884	Dec. 9, 1884	.....	.....	.....	.....
91	Dec. 10, 1884	Mar. 9, 1885	.....	.....	.....	.....
92	Mar. 10, 1885	June 9, 1885	.....	.....	.....	.....
92	June 10, 1885	Sept. 9, 1885	.....	.....	.....	.....
366						
91	Sept. 10, 1885	Dec. 9, 1885	.....	.....	.....	.....
90	Dec. 10, 1885	Mar. 26, 1886	.....	17	.....	8.1 to 7
92	Mar. 27, 1886	June 26, 1886	.....	.....	.....	.....
92	June 27, 1886	Sept. 26, 1886	.....	.....	.....	.....
365						
91	Sept. 27, 1886	Dec. 26, 1886	.....	.....	.....	.....
90	Dec. 27, 1886	Mar. 29, 1887	3	.....	.....	13.7
92	Mar. 30, 1887	June 29, 1887	.....	.....	.....	.....
92	June 30, 1887	Sept. 29, 1887	.....	.....	.....	.....
365						
91	Sept. 30, 1887	Dec. 29, 1887	.....	.....	.....	.....
91	Dec. 30, 1887	Mar. 29, 1888	.....	.....	.....	.....
92	Mar. 30, 1888	June 29, 1888	.....	.....	.....	.....
92	June 30, 1888	Sept. 29, 1888	.....	.....	.....	.....
366						

Number days during which channel was maintained. (Full quarter.)	Periods which include a full quarter and the number of days during which the channel was not maintained.		Number of days deficiency and locality of same.			Stage of river at Carrollton, La.
	From—	To—	In South Pass.	In Jetty Channel.	In Gulf of Mexico.	
91	Sept. 30, 1888	Jan. 6, 1889		8		2.6
90	Jan. 7, 1889	Apr. 6, 1889				
91	Apr. 7, 1889	July 6, 1889				
92	July 7, 1889	Oct. 11, 1889		5		2
364						
92	Oct. 12, 1889	Jan. 11, 1890				
90	Jan. 12, 1890	Apr. 11, 1890				
91	Apr. 12, 1890	July 11, 1890				
92	July 12, 1890	Oct. 11, 1890				
365						
92	Oct. 12, 1890	Jan. 11, 1891				
90	Jan. 12, 1891	Apr. 14, 1891	3			14.
91	Apr. 15, 1891	July 26, 1891		12		14.3
92	July 27, 1891	Oct. 26, 1891				
365						
92	Oct. 27, 1891	Jan. 26, 1892				
91	Jan. 27, 1892	Apr. 26, 1892				
91	Apr. 27, 1892	Sept. 19, 1892		32	23	16 to 7. 4 to 1.9
91	Sept. 20, 1892	Dec. 19, 1892				
365						
90	Dec. 20, 1892	Mar. 19, 1893				
92	Mar. 20, 1893	July 21, 1893	32			15.3 to 17.3 to 15.5
92	July 22, 1893	Oct. 21, 1893				
92	Oct. 22, 1893	Jan. 21, 1894				
366						
90	Jan. 22, 1894	Apr. 21, 1894				
91	Apr. 22, 1894	July 30, 1894	9			10.8 to 10.6 to 1.2
92	July 31, 1894	Nov. 11, 1894				
92	Nov. 14, 1894	Feb. 11, 1895				
365						
89	Feb. 12, 1895	May 11, 1895				
92	May 12, 1895	Sept. 11, 1895		31		25 to 1.6
91	Sept. 12, 1895	Dec. 11, 1895				
91	Dec. 12, 1895	Mar. 11, 1896				
363						
92	Mar. 12, 1896	June 28, 1896	5	12		11.9 to 4.7 to 10
92	June 29, 1896	Jan. 28, 1897		12		7 to 0.7 to 3.9
90	Jan. 29, 1897	May 13, 1897		11	4	6 to 1.9
6,115	Total		52	309	44	

Number of days from July 8, 1897, to May 13, 1897, both dates inclusive..... 6,520
Number of days in this period during which a legal channel was not maintained... 405

Number of days during which a legal channel was maintained..... 6,115

$\frac{6,115}{365} = 16\frac{3}{4}$ years.

AT THE HEAD OF THE PASSES.

The chart of this survey is No. 5. In comparison with a similar survey made one year previous no important change occurred during the year. In fact, the river remained comparatively low between the dates of the two surveys, and therefore there was nothing to cause any marked change. As a general result there was a slight shoaling during the year.

By reference to the profiles on chart No. 6 the great improvement in the channel into South Pass will be appreciated, and the fact that the improvement maintains from year to year, shows the efficiency of the works which caused it, although they are not so extensive as when they were built.

The channel deepened during the recent high river, but chart No. 5 represents more closely its normal condition during the year.

SURVEY OF SOUTH PASS FROM ITS HEAD TO SOUTH PASS LIGHT-HOUSE.

During the month of September, 1896, while the river was low, a survey of South Pass was made, the charts of which are Nos. 3 and 4, and the following table compiled from them gives the depth and width of channel in the different reaches:

Depth and width of channel throughout South Pass of the Mississippi River, from East Point to 30-foot depth in the main river, given in separate reaches one-fourth of a mile in length, from a survey made in September and October, 1896.

Locality.		Available depth.	Available width of—		Locality.		Available depth.	Available width of—	
From—	To above East Point.		26-foot channel.	30-foot channel.	From—	To above East Point.		26-foot channel.	30-foot channel.
East Point	¼ mile	29	240	(a)	Above East Point:				
Above East Point:					6 miles	6¼ miles	27	200	(6)
¼ mile	½ mile	27	240	(b)	6¼ miles	6½ miles	20	310	(7)
½ mile	¾ mile	27	200	(c)	6½ miles	6¾ miles	28	330	(8)
¾ mile	1 mile	29	210	(d)	6¾ miles	7 miles	31	340	90
First mile		27	200	.....	Seventh mile		27	200	.....
1 mile	1¼ miles	28	190	(e)	7 miles	7¼ miles	31	370	100
1¼ miles	1½ miles	28	180	(f)	7¼ miles	7½ miles	32	330	140
1½ miles	1¾ miles	26	180	(g)	7½ miles	7¾ miles	35	290	230
1¾ miles	2 miles	27	200	(h)	7¾ miles	8 miles	35	280	210
Second mile		26	180	.....	Eighth mile		31	280	100
2 miles	2¼ miles	28	300	(i)	8 miles	8¼ miles	32	280	190
2¼ miles	2½ miles	28	380	(j)	8¼ miles	8½ miles	31	290	170
2½ miles	2¾ miles	30	380	20	8½ miles	8¾ miles	32	250	160
2¾ miles	3 miles	30	390	110	8¾ miles	9 miles	33	220	160
Third mile		28	300	.....	Ninth mile		31	220	160
3 miles	3¼ miles	30	310	70	9 miles	9¼ miles	32	190	90
3¼ miles	3½ miles	29	270	(k)	9¼ miles	9½ miles	27	240	(9)
3½ miles	3¾ miles	28	260	(m)	9½ miles	9¾ miles	34	340	240
3¾ miles	4 miles	29	300	(n)	9¾ miles	10 miles	50	310	270
Fourth mile		28	260	.....	Tenth mile		27	190	.....
4 miles	4¼ miles	29	310	(o)	10 miles	10¼ miles	34	320	260
4¼ miles	4½ miles	29	330	(1)	10¼ miles	10½ miles	38	280	240
4½ miles	4¾ miles	31	290	90	10½ miles	10¾ miles	34	300	230
4¾ miles	5 miles	32	220	120	10¾ miles	11 miles	29	240	(x)
Fifth mile		29	220	.....	Eleventh mile		29	240	.....
5 miles	5¼ miles	29	220	(2)	11 miles	11¼ miles	42	330	270
5¼ miles	5½ miles	28	190	(3)	11¼ miles	11½ miles	27	520	(y)
5½ miles	5¾ miles	27	120	(4)	11½ miles	11¾ miles	29	(a)	(z)
5¾ miles	6 miles	27	140	(5)	11¾ miles	12 miles	b30	(b)	(b)
Sixth mile		27	120	.....	Twelfth mile		27	330	.....

a Very wide.

b In Mississippi River, above Head of the Passes.

Length of the portion of this reach not having a central depth of 30 feet.

	Feet.		Feet.		Feet.		Feet.
(a)	840	(h)	1,320	(1)	1,140	(8)	1,040
(b)	260	(i)	1,320	(2)	480	(9)	900
(c)	1,320	(j)	660	(3)	1,320	(x)	140
(d)	260	(k)	140	(4)	1,060	(y)	920
(e)	1,060	(m)	1,320	(5)	1,320	(z)	130
(f)	1,320	(n)	60	(6)	1,320		
(g)	1,320	(o)	810	(7)	1,100	Total	22,880

In comparison with a survey made one year previous, the length of channel having a less depth than 30 feet is three-quarters of a mile greater than at the time of the earlier survey.

By reference to profiles on Chart No. 6 the changes in the depth of the pass during the year and since 1875 may be noted and followed in detail. It will be seen that the pass shoaled during the year, the change above Grand Bayou being slight, while below that point it averages about 1½ feet. It is interesting to note the change in the pass since 1875—the tendency to uniformity of depth, and the fact that the shoaler areas have changed the least, while the deepest sections originally show the greatest shoaling.

The required "navigable depth of 26 feet" was maintained up to May 25, and from that time to June 30, both dates inclusive, being 37 days, such channel was not maintained in Grand Bayou Reach. The shoaling was caused by large volumes of sand moving through this reach, a phenomenon which almost invariably occurs in some part of the channel when the river is approaching its highest stage and when it begins to fall. At such times the channel is constantly changing, volume after volume of sand follow each other, and while it is reasonable to believe that dredging will aid in disintegrating them, yet, following as they do in rapid succession, particularly when the tide begins to ebb, the effect of dredging is often obliterated during the night, and at times when the dredge is working it has been observed that the shoaling was increasing.

The amount that these sand waves reduce the depth of the channel is rarely 3 feet, and generally varies from one-half a foot to 2 feet.

I have given on Plate III the section in Grand Bayou Reach, from surveys made from time to time while the shoaling was taking place, and the different results will explain the changes which take place under such conditions.

THE CHANNEL THROUGH THE JETTIES.

The channel through the jetties and beyond them to deeper water in the Gulf is shown on Chart No. 1.

There were 137 days during the year when at some point in the channel it was not maintained as required by law; that is, it was not "26 feet in depth, not less than 200 feet in width at the bottom, and having through it a central depth of 30 feet without regard to width."

From August 17 to December 16, 1896, being 122 days, the failure occurred at different localities throughout the jetty channel and at a point in the Gulf which is 1,200 feet beyond the jetties. A deep place to-day would be found shoal on the following day, and although a vigorous attempt was made to restore the channel by dredging, the progress made was extremely slight. The strong salt water reverse current which exists during low river seemed to keep the bottom alive; a moving mass of very soft material was always present near the bottom, and whatever improvement might be made by dredging when the tide was ebbing would be obliterated during the rising tide.

On November 23 dredging was discontinued, and on December 16 the channel was found to have become restored solely from the effect of a 3-foot rise of the river.

During the whole of that period of 122 days the channel was less than "200 feet in width at the bottom," and for the same time for 66 days it did not have "a central depth of 30 feet without regard to width" between the jetties, and for 31 days said depth did not obtain in the channel beyond the ends of the jetties.

From February 23 to 28, inclusive, being 6 days, the channel through the jetties was less than "200 feet in width" for a distance of 500 feet; from April 16 to 20, inclusive, being 5 days, it did not have "a central depth of 30 feet," and from May 6 to 9, inclusive, being 4 days, there was not "a central depth of 30 feet" beyond the ends of the jetties.

About the time the river reached a stage of 12 feet on the Carrollton gauge, in March, the jetty channel began to improve rapidly; the river reached its highest stage on May 13, on which date Carrollton gauge registered 19 feet, and the survey which was made a few days previously developed, as is represented on chart No. 1, the best channel which has existed since March, 1891. It is nowhere less than 32 feet in depth, and the 26 and 30 foot channels are not less than 150 and 265 feet wide, respectively.

For 15 months previous to the date (May) of this survey there had not been a central depth throughout as great as 31 feet, and for 34 months previous the 30-foot channel was less than 100 feet wide.

In my last report I mentioned the stage of the river as the prime factor in influencing the depth of water at the mouths of the passes, and while I have no doubt as to the evil effect of the Pass a Loutre Crevasse upon both South and Southwest Passes, I have maintained that during a high stage of the river a sufficient volume

of water would be forced into South Pass, notwithstanding the existence of the crevasse, to produce a wide and deep channel through the jetties, and the results verify my opinion.

Available depths and widths of channel through the jetties, in separate reaches of 2,000 feet each, according to surveys made during the fiscal year ending June 30, 1897.

Date.	Distances from East Point, in feet.								
	0 to 2,000.			2,000 to 4,000.			4,000 to 6,000.		
	Available depth.	Available width of—		Available depth.	Available width of—		Available depth.	Available width of—	
		26-foot channel.	30-foot channel.		26-foot channel.	30-foot channel.		26-foot channel.	30-foot channel.
1896.									
July	30.3	225	20	30.7	300	50	30.4	230	30
August *a*	29.3	215	.....	29.3	275	.....	29	205	.....
September	30.2	210	25	29.4	300	.....	30.3	235	20
October	30.2	160	20	30.3	265	30	30.6	210	20
November	30.8	170	20	30	250	5	30	180	10
December *a*	30.7	210	25	30.7	260	35	31.1	200	30
1897.									
January	30.4	215	20	30.5	270	30	31.2	210	20
February	30	275	5	30.2	280	30	30	240	20
March	30.5	240	50	30.4	330	40	30	275	5
April	*b* 30.5	250	100	30.6	330	160	31.4	300	180
May	32	360	150	32	325	200	32	290	180
June	30.4	280	110	31.7	315	200	33.2	295	180

Date.	Distances from East Point, in feet.								
	6,000 to 8,000.			8,000 to 10,000			10,000 to 12,000.		
	Available depth.	Available width of—		Available depth.	Available width of—		Available depth.	Available width of—	
		26-foot channel.	30-foot channel.		26-foot channel.	30-foot channel.		26-foot channel.	30-foot channel.
1896.									
July	30.4	210	20	31.1	210	20	31.1	215	40
August *a*	29	205	.....	29.4	130	.....	30.2	145	10
September	29	115	.....	29.9	80	.....	30.1	80	10
October	30.5	165	10	30.4	100	5	30.2	150	10
November	30.4	130	10	30.3	160	10	30.4	80	10
December *a*	30.8	200	30	30.9	210	25	31.1	210	30
1897.									
January	30.5	210	20	30.4	200	20	30.6	210	25
February	30	200	5	30.4	210	10	31	*c* 190	30
March	30.3	250	30	30.6	250	30	31.8	235	35
April	31.6	265	105	32.2	270	85	33.1	255	170
May	33	265	180	35	265	200	34	260	190
June	35	260	190	36	255	190	39	280	200

a From August 17 to December 16, both dates inclusive (122 days), there were localities where the central depth was less than 30 feet, and the 26-foot channel was less than 200 feet wide. During a portion of this period (August 17 to September 16, inclusive), there was not "a central depth of 30 feet" at a locality from 1,230 to 1,360 feet beyond the ends of the jetties.

b Less than 30 feet from April 16 to 20, both inclusive.

c Less than 200 feet wide for 6 days, from February 23 to 28, both inclusive.

By reference to the profiles on Chart No. 6 the amount that the jetty channel deepened at every point may be followed.

The following table gives the available depths through the jetties at various dates since 1875, and explains the changes in the depth of that channel from that time to the present.

Table giving the depths of water through the jetties at various dates.

Date.	Distances from East Point, in feet.					
	0 to 2,000.	2,000 to 4,000.	4,000 to 6,000.	6,000 to 8,000.	8,000 to 10,000.	10,000 to 12,000.
1875—June	22.5	18.7	16.7	10.2	9.7	9.2
1876—May	23.3	20.3	22	21	17.1	15
August	23.5	19.6	21	23.5	23	19.8
November	22	20.3	21.1	21.2	21.1	20.3
1877—March	24.1	21.1	23.2	22	21.2	20.5
July	24.9	24	26	23.8	23.5	20.3
October 25 to December 14	26.3	24.4	28.5	24.2	23	23.7
1878—March	26	25.9	35.5	25.4	24.3	23
December	28.4	26.4	35.7	27.1	25.3	23
1879—March	28.6	27.5	43.4	27	27	27
June	27.5	28.4	47.7	29.2	29.2	28
July 8	30.5	30.7	.....	31	30.7	30.5
December	31	31	48.3	31.7	31.8	30.8
1880—June	31	32.5	47.8	31.4	35.1	32
July	30.5	31	44	30.8	31.5	30.5
August	30.5	30.4	46	32	32	30.5
September	30.7	31	44.4	30.6	32	31
October	31	31.5	41	30.3	31	30.5
November	30.6	31	40.3	30.8	30.9	30.5
December	30.9	30.6	43	30.8	31	30.3
1881—January	30.5	30.4	41.9	33.8	30.7	30.3
February	30.4	30.2	41.6	32	31	30
March	31.5	31.2	41.3	32	32	30.5
April	30.4	30	43	33	33	30.5
May	30.2	30.5	42.7	32.6	30.5	31.2
June	30	30.5	43.8	32	31.7	31.7
July	31	32	42.5	33.5	33	32
August	30.1	32	37.6	32	31	30.2
October	30.2	30.3	38.3	31.4	31.2	30.3
1882—January	30.5	30.4	41.3	31.1	30.2	30.7
February	31.8	36	39.7	30.5	30.8	30.2
March	31.2	30.6	39.2	30.8	31.6	32.5
April	31.7	32.6	39.6	30.5	30.3	33
May	30.5	32.5	39.4	31	31.3	31
June	30.8	35.5	39	31.3	31.3	31
July	30	32.7	38.7	30.6	31.3	31.5
August	30.3	32.2	38.1	31.8	31.8	30.5
September	30.1	31.5	38.3	31.9	30.8	30.5
October	30	31	37.1	31	31.4	31.2
November	30	32	38.1	21.5	31.2	31.2
December	31	31	37	31.2	31	30.4
1883—January	31	31	35.2	30.2	30.1	30.1
February	31.2	31.2	36	30.5	30	30.1
March	32.3	32.6	45.7	31.5	30.3	30.3
April	33.7	35	44	32.2	30	30
May	33.2	36.3	46	32.3	30.3	32.4
June	32.5	34.2	45	33.4	31	33
July	33.8	34.9	44	32	31.5	31.8
August	32.1	38.2	48	33.4	33.4	32.2
September	33.4	34.3	46	32.3	32.3	30.6
October	32.7	34.1	41.5	32	32	30.5
November	31	33.8	43.8	34.5	31.5	31
December	30.5	32.6	43	31.6	31.6	30.2
1884—January	31.2	32.2	39.2	32.7	31.8	30.3
February	32	31.5	41.3	31.6	31	30.7
March	35.7	39.5	41.6	34	33.8	38.7
April	35.3	37.3	41.5	31.7	32.7	35.4
May	34.9	35.8	42.3	34.3	35.1	33
June	35	35.8	41.1	34	35	35
August	31.9	35.8	41.9	33.9	35	32
September	32	34	39	33.1	33.7	33.5
October	31.1	33.4	38.6	32.6	32.6	32.5
November	32.8	32.8	37.2	32.2	32.4	30.8
December	31.6	32.6	37.1	31.1	31.5	31.4
1885—January	36.7	36.4	36.9	33.1	34.6	32.8
February	41.7	36.3	35.7	30.5	34.1	36.2
March	35.5	36	36.1	31	31.7	35.7
April	36	35.5	37	32	32.6	32
May	36.7	35	35.6	31.5	33.5	31.5
June	34.7	33.7	35.7	32.8	32.8	31.3
July	36.3	33.1	36.5	33.7	33.6	31
August	36.5	35.6	37.6	33	32	31
September	35.3	33.3	35.2	32.2	30.7	31.7
October	33.8	33.7	35.8	31.3	30.4	30.4
November	32.7	32.8	35.1	30.8	30.6	30.1
December	33	32.2	34.2	30.9	30.5	30.6
1886—January	33.6	32.5	33	30.2	30.2	28.5
February	32.8	32.8	34.1	31.3	30.9	30
March	32.8	35.8	34	35	33.1	32
April	35.4	34.5	34.5	33.7	33.7	31
May	35.9	35.6	34.2	31	36	34.4

Table giving the depths of water through the jetties at various dates—Continued.

Date.	Distances from East Point, in feet.					
	0 to 2,000.	2,000 to 4,000.	4,000 to 6,000.	6,000 to 8,000.	8,000 to 10,000.	10,000 to 12,000.
1886—June	38.2	35.2	33.4	33.2	34.5	36.5
July	36.7	36.7	36.2	32.8	32.7	37
August	35	36	35.7	34.8	33.8	34.7
September	34.5	35.6	34.6	33.7	33.6	33
October	35	36.2	34.4	33	34.1	33
November	34.5	35.6	34.8	32.9	33	33.5
December	34	35	35.3	33.6	32.6	33
1887—January	33.6	34	33.3	32.3	32.7	33.4
February	36.4	34.4	35.4	31.3	34.1	32.4
March	35.5	35.5	32.6	35.5	35.5	33.8
April	38.8	37	33.7	31	34.8	35.5
May	39.4	35.3	37.1	31.2	34.2	38.1
June	39	35.4	37.5	32.3	34.1	35.2
July	39	36.4	35.8	34	32	34
August	35.7	34.6	34.7	33.6	31.6	32.7
September	36	34	35	35	32.7	32.2
October	36.2	34.2	34.3	32.1	32.2	31.8
November	35.9	32.9	33.8	30.7	31.8	31.2
December	34.7	32.7	33.9	30.9	31.7	31.8
1888—January	35.6	32.5	33.7	30.5	31.5	32.2
February	34.3	32.4	32.5	31	31	32
March	34	33	32.6	30.5	31.3	30.9
April	36.3	34.8	33.8	31	35	31.4
May	35.2	35.2	34.3	31.6	33.6	33
June	32	33	33	31.4	35.5	33.2
July	34.2	34	33.8	31	31.9	33.6
August	33.7	33.7	33.7	31.2	31.2	33.2
September	32.7	32.7	32.8	30.8	31	32
October	33.3	33.3	32.3	30.6	30.4	30.4
November	31.8	32.8	31.7	30.6	30.6	30.8
December	31.4	32.4	31.6	30.3	a 29.2	30.7
1889—January	31	31.3	30.6	30.3	31	30.9
February	32.4	32.5	31.8	32.8	31	32.5
March	30.2	32.2	30.4	32.3	31.8	31.6
April	30.8	32.1	31.2	32.8	32.8	30.6
May	30.8	32	30.7	32.6	31.2	30.8
June	30.4	32.2	31.3	31.5	31	30.8
July	30.3	31	31	32.4	31.3	31
August	31.7	31.4	31.5	31.6	31.4	31
September	30.9	31.3	31.2	31	31.1	.....
October	31.6	31	31.2	31	31.7	b 29.6
November	31	31.2	31.2	31	31.3	31.4
December	30.8	31	31.2	31	31.7	31.2
1890—January	30.8	30.8	31.2	30.6	31	31
February	31.7	30.7	31.5	32.6	34.4	33
March	36.4	33.2	34	34	34	33.6
April	33.4	36	35	35	38.7	34.5
May	32	34	34	36	39	34
June	32	33.5	33	34	39.8	35
July	32.4	33.4	34	34	39	37
August	32	33	33	32.7	35	34
September	30.5	31.4	33	33	35	33
October	32	31	31	30.5	34	32.8
November	30.6	31.2	30.6	30.6	34	33
December	31.5	31.2	30.7	30.7	32.3	33.5
1891—January	31	31	31.2	32.2	32.3	32.5
February	31.7	31	31.4	32.5	35.2	32.7
March	32	34.3	36.4	37.5	36	34.6
April	30.5	32	36.5	39	36.4	34.2
May	30.3	32	32	35	36	34
June	33	31.1	32	34.7	37	35
July	31.4	30.4	30.4	33.3	35.8	34.8
August	31	31	31	32.3	32.9	31.4
September	30.6	30.6	30.7	31	31.5	.....
October	31	30.8	30.8	31.2	31.2	30.7
November	31.2	31	31.3	31.2	31.1	30.6
December	30.1	30.3	30.6	31.4	31.3	32
1892—January	31.3	31.6	31.3	31.3	31.8	32.2
February	30.5	30.8	30.8	31	31.1	31.7
March	30.8	30.7	31.4	31.7	31.2	31
April	32	32	33.7	32	30.5	30.6
May	c 28.1	a 29.6	38	35	33	32
June	d 30.4	32.3	36	37	36.6	33.2
July	31.5	33	32	35.6	38	34.2

a From December 28, 1888, to January 4, 1889, inclusive.
b From October 1 to October 5, inclusive.
c Depth less than 30 feet from April 25 to May 6, both dates inclusive, and varied from 27.5 to 29.4 feet.
d Depth less than 30 feet from May 20 to June 20, both dates inclusive, and varied from 28.1 to 29.6 feet.

Table giving the depths of water through the jetties at various dates—Continued.

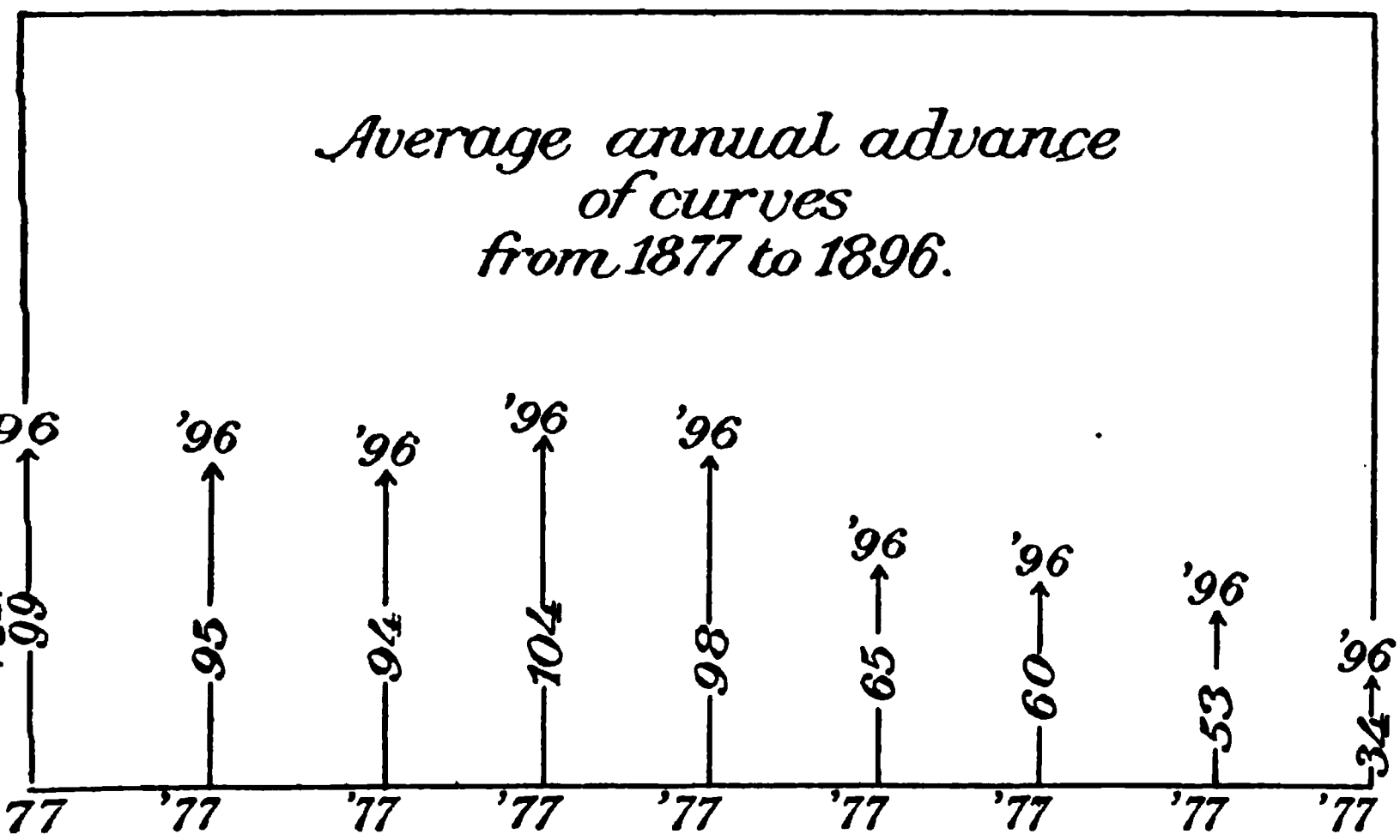
Date.	Distances from East Point, in feet.					
	0 to 2,000	2,000 to 4,000.	4,000 to 6,000.	6,000 to 8,000.	8,000 to 10,000.	10,000 to 12,000.
1892—August	31.5	33.5	33.8	34.6	34.8	35
September	31.2	32.7	31.2	33.6	33.7	33.5
October	31.8	32.5	31.8	31.5	32.7	32.3
November	31.5	32.1	31.5	32	33	32.6
December	31	31.5	31.6	32.1	33.5	33.1
1893—January	31.6	32.2	31.3	32.1	32.2	34.1
February	31.6	31.6	31	31.6	32.7	34
March	33.6	34.6	33.1	30.8	31.2	32.4
April	33.6	35	33.6	31.6	32.3	32.6
May	32	34	33	33	32.5	32
June	32.7	33	33.8	36	31.7	30.5
July	32	33.3	34	35	36.7	35
August	32	32	34	34.5	35.3	34.2
September	31.5	31.5	32.4	33.5	35.3	31.8
October	31.5	32.2	32.7	33.2	34.2	33.2
November	31.4	32.7	33.3	32.8	34.3	33
December	31	32	33	33	34.8	33.5
1894—January	32.1	32.1	33.5	33.2	36.8	34.5
February	30.6	32.2	32.6	32.6	34.5	33
March	32.8	31.8	31.7	32	34.2	34
April	34.3	31.4	32.7	33	32.3	34
May	32	32	34	34	34	33
June	32.2	31.2	32.9	33	32.7	33.6
July	32.1	31.6	31.7	31.5	31.8	32.6
August	31.2	30.5	31.2	30.2	*a* 28.9	30.3
September	31.3	30.6	30.6	30.5	30.3	30.5
October	30.4	30.4	30.1	30.8	30.6	30.4
November	30.3	30.3	30.6	30.3	30.3	30.8
December	30.8	30.6	31.3	30.7	30.7	30.7
1895—January	31.7	32.1	32.1	31.6	31.5	31.9
February	31.9	32.4	31.7	31.8	31.8	31.8
March	32.8	32.1	31.6	31.6	31.7	32.3
April	32	31.9	31.5	31.6	31.8	32.2
May	31.4	31.5	31.4	31.4	31.9	31.6
June	31.4	31.7	31.6	31.3	31.3	31.5
July	31.7	31.7	32	31.5	31.8	32.1
August	32.2	31.8	31.8	31.3	31.1	31.4
September	31.8	31.7	31.8	31.4	31.4	31.4
October	30.9	30.9	31.8	31.3	31.5	31.2
November	31.7	31.5	31.8	31.3	32.1	32.1
December	31.3	31.4	38.1	31.4	31.9	31.2
1896—January	31.3	30.9	32.1	31.9	31.3	32.4
February	31.3	31.1	31.3	31.3	31.5	31.5
March	30.6	30.3	30.5	31.1	32	32
April	30.5	30	30.3	30.4	31	31.9
May	30.3	30	30.2	30	31	32.4
June	30.2	30.2	*b* 30.2	*b* 30.2	*b* 30.2	32.2
July	30.3	30.7	30.4	30.4	31.1	31.1
August	*c* 29.3	29.3	*c* 29	*c* 29	*c* 29.4	30.2
September	30.2	29.4	30.3	29	29.9	30.1
October	30.2	30.3	30.6	30.5	30.4	30.2
November	30.8	30	30	30.4	30.3	30.4
December	30.7	30.7	31.1	30.8	30.9	31.1
1897—January	30.4	30.5	31.2	30.5	30.4	30.6
February	30	30.2	30	30	30.2	31
March	30.5	30.4	30	30.3	30.6	31.8
April	*d* 30.5	30.6	31.4	31.6	32.2	33.1
May	32	32	32	33	35	34
June	30.4	31.7	33.2	35	36	39

a August 20 to 31, both dates inclusive.
b Less than 30 feet from June 15 to 18, both inclusive.
c Less than 30 feet from August 17 to October 21, both inclusive.
d Less than 30 feet from April 16 to 20, both inclusive.

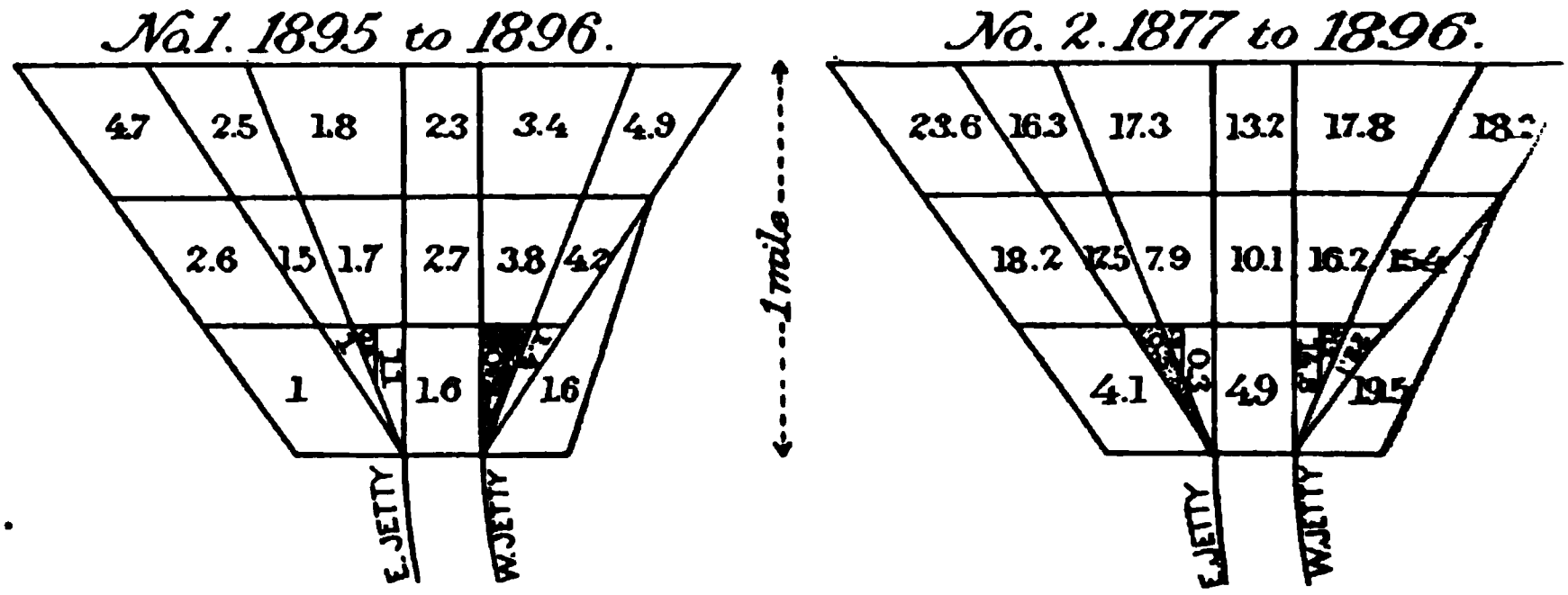
SURVEY BEYOND THE ENDS OF THE JETTIES.

The chart of this survey is No. 2. By reference to Plate I it will be seen that all the curves except the 20-foot one advanced during the year, the 40-foot curve showing the greatest advance of 242 feet and the 30-foot curve the least, being 19 feet.

The following diagrams give the distance that each curve has advanced since 1877, and the average annual advance of each. It will be seen that the 70-foot curve shows the greatest advance and the 20-foot curve the least. The average advance of all of them is 78 feet, the average of those from 20 to 50, inclusive, is 53 feet, and of those from 60 to 100, inclusive, 98 feet.


Average annual advance
of curves
from 1877 to 1896.
FEET
99
95
94
104
98
65
60
53
34
'96
'77

Advance of curves
from
1877 to 1896.
FEET
1875
1807
1783
1977
1867
1228
1149
1000
641
100 foot curve
90 " "
80 " "
70 " "
60 " "
50 " "
40 " "
30 " "
20 " "
'96
'77



The general advance of the curves is indicative of a shoaling beyond the ends of the jetties; the amount and distribution of it over an area containing 1¼ square miles will be readily understood from the following diagrams, which represent the area under consideration.

The figures in each area are the differences, in feet and tenths, between the mean depths obtained for the years between which comparisons are made, and denote the amount of shoaling or deepening in each.

No. 1 compares the mean depths in 1895 with those in 1896, and No. 2 compares those in 1876 with those in 1896. Shaded areas deepened and all others shoaled.

The following table gives the amount of the mean change over the whole area from year to year since 1876:

Mean change over whole area.

From—	To—	Deepened.	Shoaled.	From—	To—	Deepened.	Shoaled.
		Feet.	*Feet.*			*Feet.*	*Feet.*
1876	1877		0.40	1887	1888		0.36
1877	1878	1.78		1888	1889	1.52	
1878	1879		2.24	1889	1890		1.09
1879	1880	.02		1890	1891		2.55
1880	1881		2.18	1891	1892		1.42
1881	1882		1.31	1892	1893		2.65
1882	1883	.25		1893	1894	1.06	
1883	1884		3.62	1894	1895	.81	
1884	1885	1.17		1895	1896		2.6
1885	1886		.14	1876	1896		14.71
1886	1887		1.44				

In this connection and in compliance with your request I have given on Plate II a comparison of the position of the various curves in 1879 and 1896.

VELOCITY, SEDIMENT, AND TIDAL OBSERVATIONS.

In my last report I gave the results of velocity and sediment observations which completed the record from 1877 to May, 1896. These were continued during the year, but the record is omitted at this time, as it contains nothing of special interest.

On account of the lack of sufficient funds to meet the expenses for determining the velocity of discharge of each of the three passes this work could not be done.

Tidal readings on Port Eads and East Bay gauges, the former being in South Pass, the latter in a bay to the westward of South Pass and so situated as to give Gulf-level readings.

Lunation.		Port Eads gauge.		East Bay gauge.		Difference between Port Eads and East Bay at—		Rise and fall of tide at Port Eads.	Mean reading of Carrollton gauge.
From—	To—	High.	Low.	High.	Low.	High tide.	Low tide.		
1895.	1895.								
Low river:									
July 27.....	August 22....	3.858	2.544	3.592	2.172	0.266	0.372	1.314	2.88
August 23.....	September 18..	3.994	2.776	3.810	2.430	.184	.346	1.218	1.64
September 19..	October 16....	4.378	3.210	4.128	2.812	.250	.398	1.168	1.43
October 17.....	November 12..	3.922	2.662	3.806	2.352	.116	.310	1.260	0.46
November 13..	December 9...	3.634	2.189	3.530	1.884	.104	.305	1.455	0.16
December 10..	January 6	3.567	2.166	3.323	1.760	.244	.406	1.401	1.19
Average	.....	3.892	2.591	3.698	2.235	.194	.356	1.301	.....
1896.	1896.								
High river:									
January 7.....	February 2...	3.841	2.421	3.453	1.839	.388	.582	1.420	5.64
February 3....	February 29..	3.618	2.394	3.158	1.758	.460	.636	1.224	6.81
March 1.....	March 28.....	3.518	2.436	3.059	1.753	.459	.683	1.082	7.89
March 29.....	April 24.....	3.915	2.704	3.348	1.967	.567	.737	1.211	10.56
April 25.....	May 22.....	4.074	2.729	3.671	2.128	.403	.601	1.345	8.48
May 23.....	June 18.....	4.358	2.907	3.969	2.405	.389	.502	1.451	7.40
June 19.....	July 15.....	4.158	2.679	3.764	2.166	.394	.513	1.479	6.32
July 16.....	August 11....	3.868	2.528	3.492	2.028	.376	.500	1.340	4.63
August 12.....	September 8..	3.944	2.782	3.604	2.319	.340	.463	1.162	4.68
Average	.....	3.921	2.620	3.502	2.040	.419	.580	1.301	.....
Low river:									
September 9...	October 5.....	4.075	2.972	3.837	2.600	.238	.372	1.103	1.43
October 6.....	November 2..	4.105	2.963	3.797	2.487	.308	.476	1.142	1.18
November 3...	November 29.	4.209	2.858	3.970	2.465	.239	.393	1.351	1.13
November 30..	December 26..	3.978	2.518	3.613	1.989	.365	.529	1.460	2.30
December 27..	January 22....	4.032	2.666	3.661	2.140	.371	.526	1.366	3.44
Average	.....	4.079	2.795	3.775	2.336	.304	.459	1.284	.....
1897.	1897.								
January 23....	February 19..	3.958	2.699	3.459	2.072	.499	.627	1.259	6.72
February 20...	March 18.....	3.981	2.870	3.294	2.118	.687	.752	1.111	10.53
March 19.....	April 14.....	4.377	3.295	3.699	2.334	.678	.961	1.082	15.88
Means	.....	3.972	2.694	3.610	2.173	.362	.521	1.278	.....

In the above table I have omitted the record of a gauge in Garden Island Bay since the level of the bay is influenced by the water coming through Pass a Loutre Crevasse, and also because it does not always give the extreme low-tide readings. The bay in this vicinity is so shoal that the gauge could not be located at a point where it would be both readily accessible and safe and at the same time record the extreme low tides, and at the time it was established it was for the purpose of ascertaining the average flood tide.

East Bay gauge gives a complete Gulf-level record, which alone should be used in comparison with that of the Port Eads gauge.

THE NAVIGATION OF THE CHANNEL.

During the year I reported the grounding of 14 steamers and 1 ship, as follows: One on a shoal in the entrance to South Pass at its head, 2 in Goat Island Reach, 7 in Grand Bayou Reach, 1 near Port Eads, 3 in the jetty channel near the sea end, and 1 beyond the ends of the jetties. But 4 of these vessels drew 25 feet, 4 drew 24½ feet, and the draft of the others varied from 17 to 23½ feet.

They were aground from one to one hundred and five hours, the greatest delay being in the case of the steamship *Barbara*, and in this case the delay was principally because of the damage to her wheel, rudder, and sternpost by being driven with great force against a bank of oyster shells.

Except in five cases these mishaps were not attributable to any lack of sufficient depth and width of channel. While the depth of the channel in Grand Bayou Reach was continually changing, it was difficult to know at all times where the deepest water was. Great care was exercised by pilots, however, and in the case of

each of the five vessels grounding during that time the delay was slight, being but three and a half hours in the extreme case.

CONCLUSION.

During the year I was ably assisted by Assistant Engineer G. W. Lawes.

Very respectfully, your obedient servant,

C. DONOVAN, *Assistant Engineer.*

Maj. JAMES B. QUINN,
Corps of Engineers, U. S. A.

EXAMINATIONS AND SURVEYS AT SOUTH PASS, MISSISSIPPI RIVER.

[Printed in House Doc. No. 296, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 9, 1897.

SIR: The river and harbor act of August 11, 1888, provides by a permanent appropriation for examinations and surveys at South Pass, mouth of the Mississippi River, pursuant to the act of March 3, 1875, authorizing work there by James B. Eads. The amount thus provided is not to exceed $10,000 annually, and this sum has ordinarily been found adequate for the purpose.

Under a recent ruling of the Treasury officials the unexpended portion of the appropriation at the end of the fiscal year has been required to be returned to the Treasury, and for the fiscal year ending June 30, 1896, the sum of $1,100 was returned to the Treasury.

Maj. James B. Quinn, Corps of Engineers, the officer in charge of these examinations and surveys, has addressed a letter to the Chief of Engineers explaining that the balance remaining available of the appropriation for the year ending June 30, 1897, will not be sufficient to carry on desired work, and that such condition is embarrassing, as just at this time certain examinations are required in order to determine the precise relations which have been brought about by the crevasse in Pass a Loutre.

I have the honor to submith herewith a copy of Major Quinn's letter, dated February 4, 1897, and recommend that as the subject is one of importance, and the intended examination being deemed necessary to protect the interests of the United States, the subject be brought to the attention of the chairman of the Committee on Appropriations of the House of Representatives with request that if possible an item be inserted in one of the appropriation bills making an appropriation of $1,000 for surveys at the mouth of the Mississippi during the present fiscal year, in addition to the $10,000 provided by the act of 1888.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

LETTER OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

OFFICE UNITED STATES ENGINEER,
New Orleans, La., February 4, 1897.

GENERAL: The Treasury Department having required the return to the Treasury of the sums of unexpended balances appertaining to the

examinations and surveys of South Pass, Mississippi River, I am deprived of the necessary amount to complete some of the examinations I had desired to make at the period of high water, as, for example, the gauging of the pass in order to determine the precise relations which have been brought about by the crevasse in Pass a Loutre.

As the situation is becoming rather strained, owing to the difficulties the Eads representatives are meeting with in maintaining the required channel, and the possible legal complications arising from certain occurences which will be used by them to protect themselves from failure to receive their several sums of money in due time, I feel in hopes that the Department may be able to assist me in some way to the extent of about $1,000 for the present fiscal year, and to take some measures to increase the present allowance for the examinations and surveys at South Pass about $1,500 per year, in order to provide for contingencies such as may be said to exist at present.

With the funds available for the present fiscal year I shall be obliged to lay off for a month the men employed on the work, and this may result in considerable embarrassment in the event that something unusual should happen about this time.

I feel in hopes that the little savings which were lost to the work by the decision of the Treasury Department may at least be restored, so that the important determinations aforesaid may not be wholly impossible.

Very respectfully, your obedient servant,

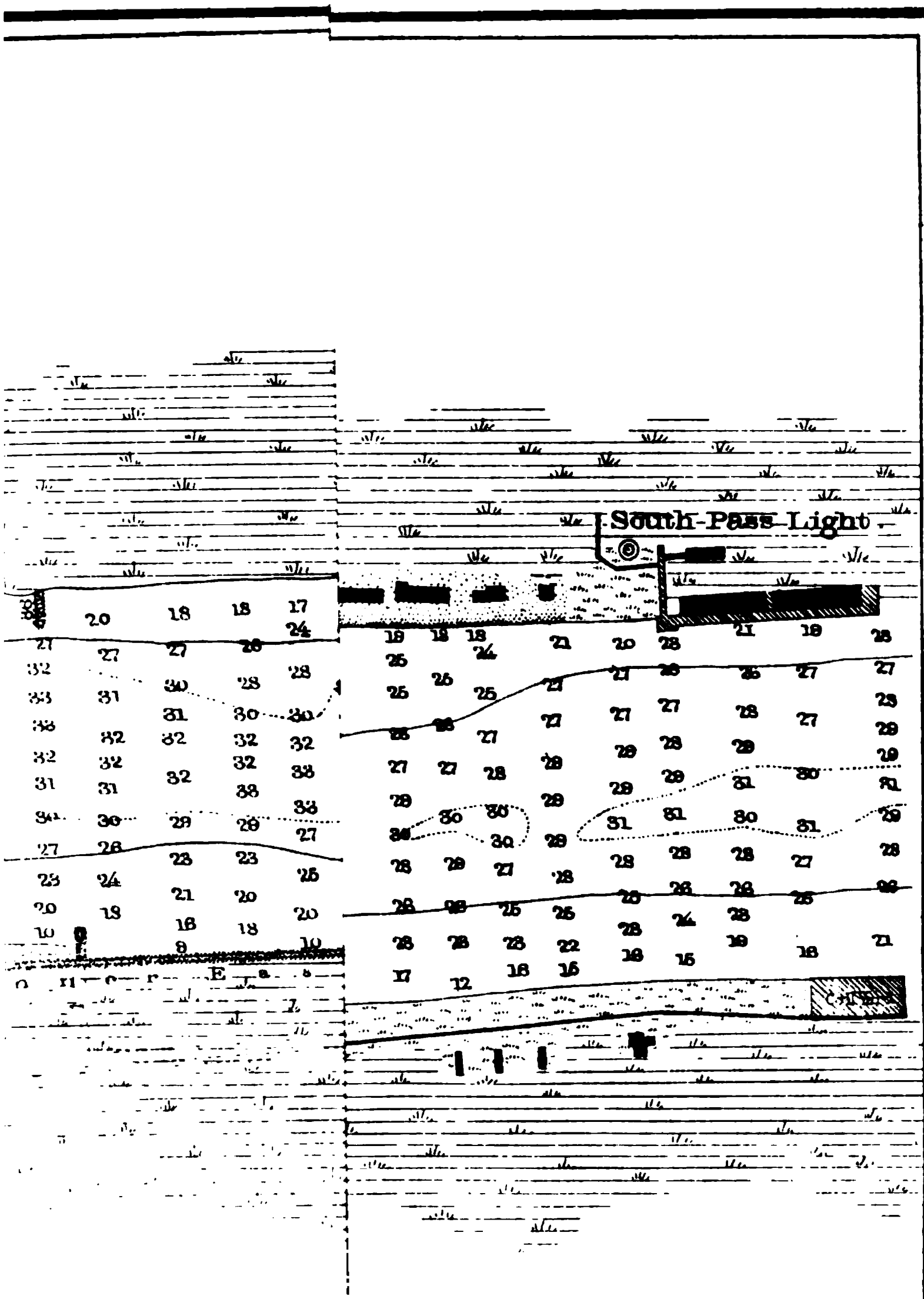
JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1897, by the Chief of Engineers.

Examinations and surveys at South Pass, Mississippi River:
For continuing examinations and surveys at the South Pass of the Mississippi River as provided for in the act of March 3, 1875 (act of March 3, 1875, vol. 18, p. 463, sec. 4; act of August 11, 1888, vol. 25, p. 424, sec. 4)..... $1,000

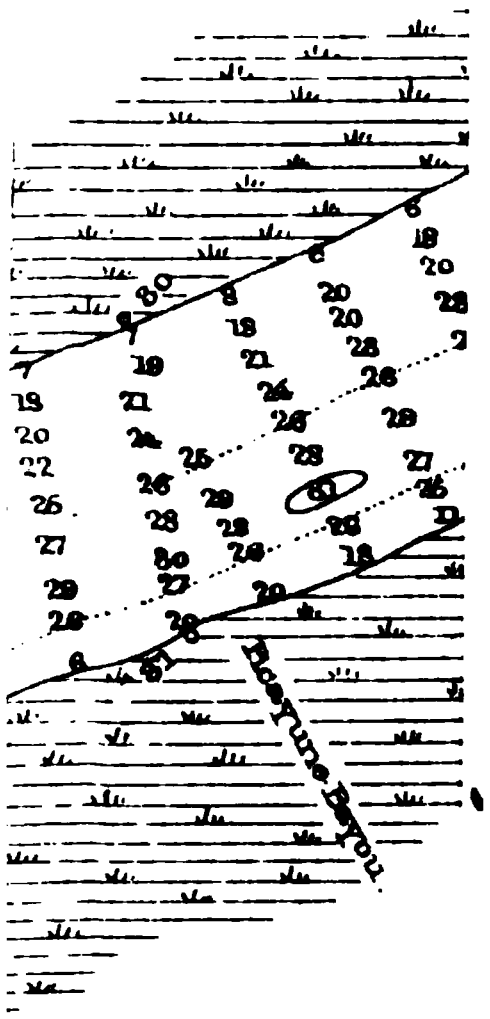
NOTE.—The necessity for this appropriation is set forth in the attached letter of February 9, 1897, from the Chief of Engineers to the Secretary of War.

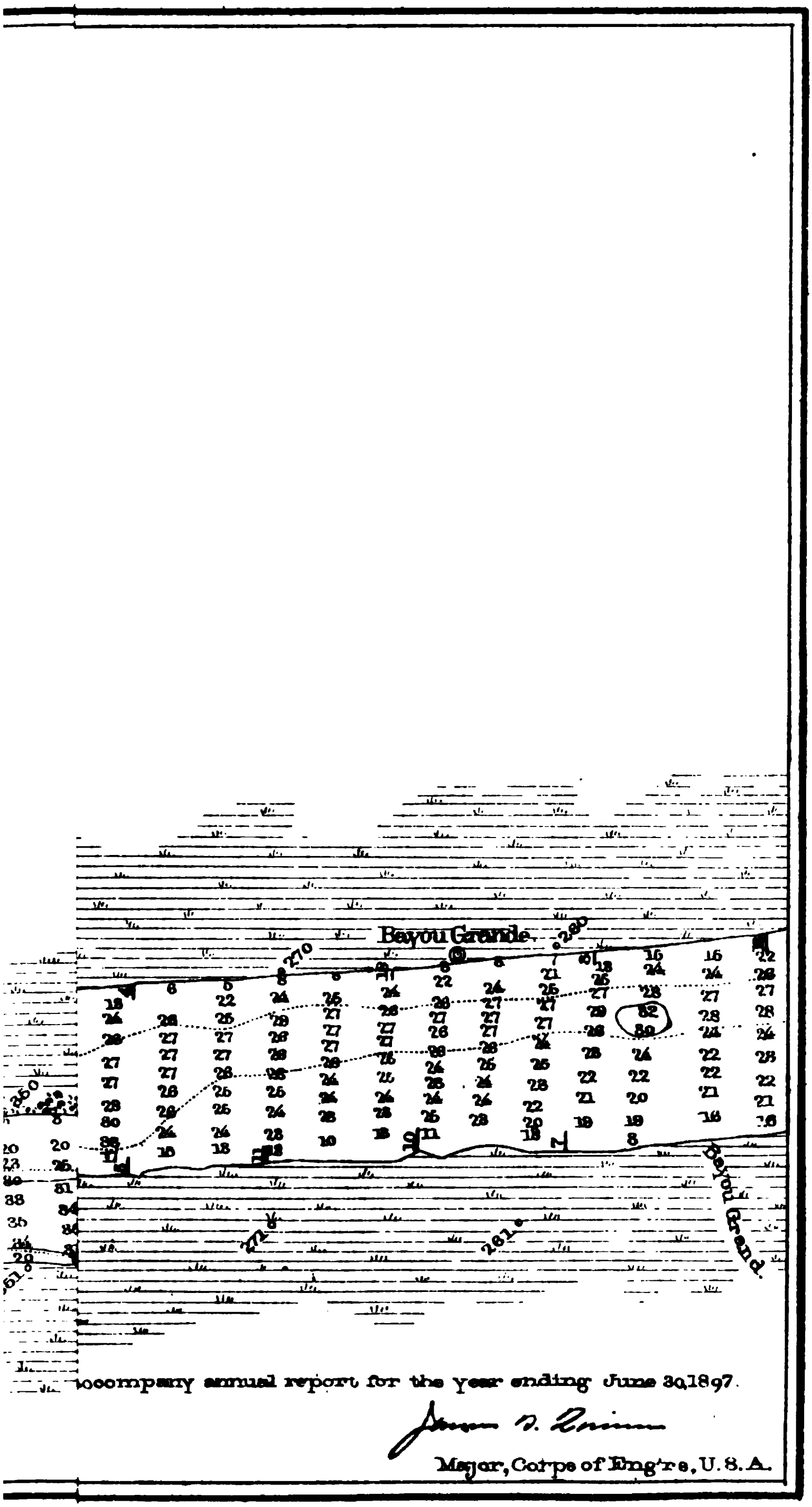


port for the year ending June 30,1897.

James D. Reeves

Major, Corps of Engrs, U.S.A.

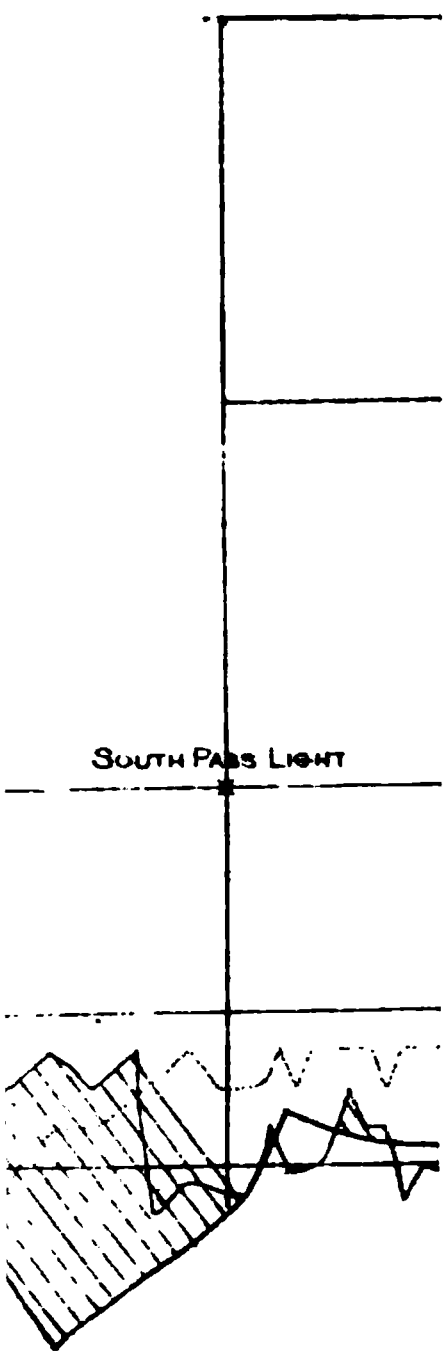

Bear Tune Bayou

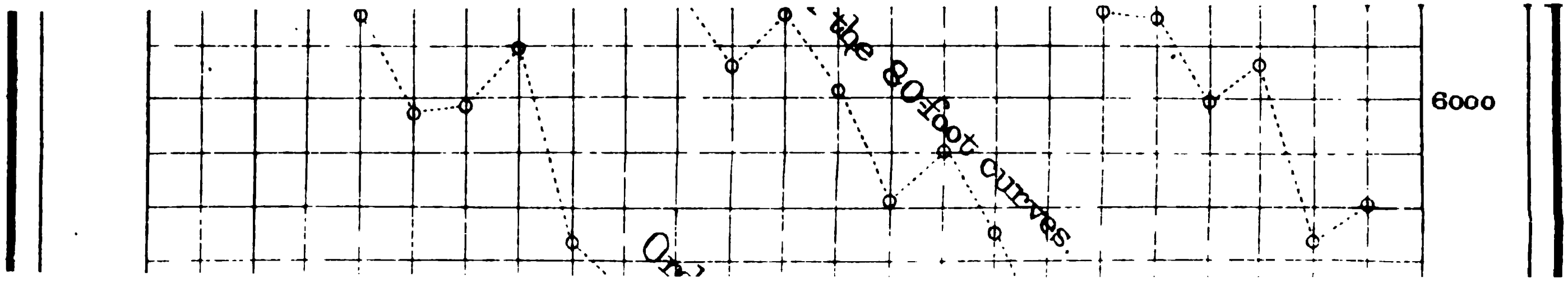


ooompany annual report for the year ending June 30,1897.

James D. Quinn

Major, Corps of Eng'rs, U.S.A.


South Pass Light


the 80-foot curves.
6000

8

PLATE II.

rative Curves

depths in the

OF MEXICO,

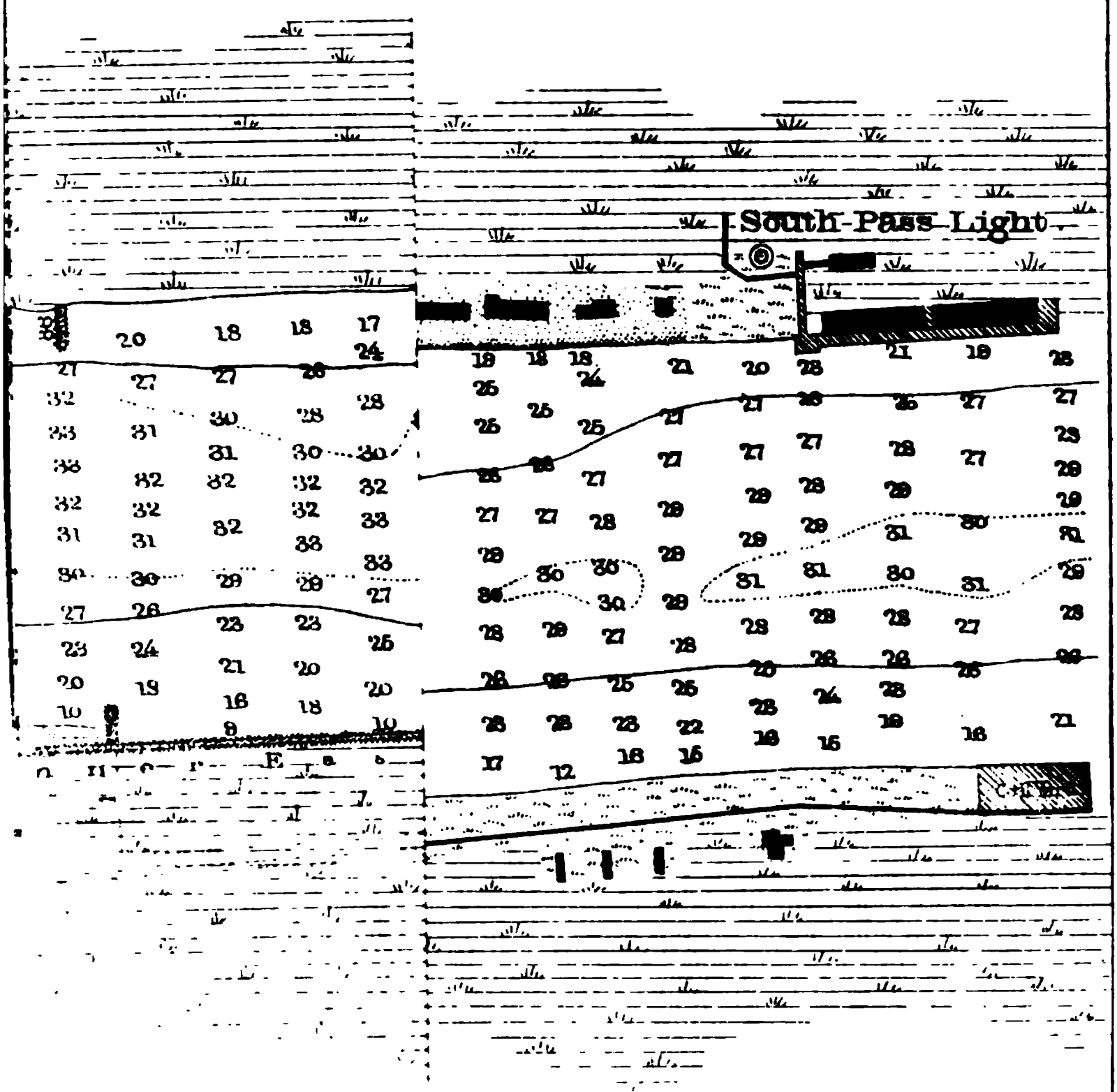
nd the ends of

Pass Jetties

SURVEYS MADE IN

79 and 1896.

Eng 55 2



port for the year ending June 30,1897.

James D. Dziura

Major, Corps of Engrs, U.S.A.

APPENDIX S.

IMPROVEMENT OF RIVERS AND HARBORS IN SOUTHERN LOUISIANA AND EASTERN TEXAS.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Chefuncte River and Bogue Falia, Louisiana.
2. Tickfaw River and its tributaries, Louisiana.
3. Amite River and Bayou Manchac, Louisiana.
4. Bayou Lafourche, Louisiana.
5. Bayou Plaquemine, Grand River, and Pigeon bayous, Louisiana.
6. Bayou Courtableau, Louisiana.
7. Bayou Teche, Louisiana.
8. Channel, bay, and passes of Bayou Vermilion, Louisiana.
9. Mermentau River and tributaries, Louisiana.
10. Mouth and passes of Calcasieu River, Louisiana.
11. Harbor at Sabine Pass, Texas.
12. Sabine River, Texas.
13. Neches River, Texas.
14. Closing crevasse in Pass a Loutre, Mississippi River.
15. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

16. Homochitto River, Mississippi.
17. Channel through Atchafalaya Bay, Louisiana.
18. Bayou Grossetete, Louisiana.

SURVEYS.

19. Bayou Teche, Louisiana.
20. Sabine Lake, Texas.

OFFICE UNITED STATES ENGINEER,
New Orleans, La., July 16, 1897.

GENERAL: I have the honor to transmit herewith annual reports upon works of river and harbor improvement at present under my charge for the fiscal year ending June 30, 1897.

* * * * * * *

Very respectfully, your obedient servant,

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

§ 1.

IMPROVEMENT OF CHEFUNCTE (TCHEFUNCTE) RIVER AND BOGUE FALIA, LOUISIANA.

The project for the improvement of this stream was adopted in 1880 and modified in 1884, and provided for the removal of obstructions, the construction of a breakwater at the mouth, and the dredging of the bar to a depth of 6 feet.

With the various appropriations made from 1881 to 1894, aggregating $8,500, this work was carried on, resulting in great improvement to the stream, which was rendered navigable for steamers drawing 5 feet of water as far as Covington, La., a distance of 14 miles.

The last work on this improvement was done in February, 1895, and the work done is at this time in a fairly good condition.

There was expended on the work to June 30, 1896, the sum of $8,330.29.

By act of June 30, 1896, an appropriation of $1,000 was made for maintenance of the improvement, but nothing has been done as yet with this amount.

It is estimated that about $1,000 annually will be required to maintain the improvement.

For detailed information, see Appendix R, Annual Report of Chief of Engineers for 1896, page 1485.

The amount expended during the past year was $19.

Money statement.

July 1, 1896, balance unexpended	$1,169.71
June 30, 1897, amount expended during fiscal year	19.00
July 1, 1897, balance unexpended	1,150.71
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	*1,000.00

Abstract of appropriations for improving Chefuncte (Tchefuncte) River and Bogue Falia, Louisiana.

By act of Congress—	
Approved March 3, 1881	$1,500
Passed August 2, 1882	1,500
Approved August 5, 1886	2,500
Approved September 19, 1890	1,000
Approved July 13, 1892	1,000
Of August 18, 1894	1,000
Passed June 3, 1896	1,000
Total	9,500

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	17
Trips	820
Net registered tonnage (820 trips)	106,200
Schooners	42
Trips	445
Net registered tonnage (445 trips)	14,469
Barges	19
Trips	209
Net tonnage (209 trips)	13,192
Total vessels	78
Total trips	1,474
Total tonnage (1,474 trips)	133,861

Draft of heaviest vessel, light, 5.2 feet; loaded, 7 feet.

* The estimate submitted is for maintenance, $1,000 being required annually.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Lumber, shingles, laths	43,374	$192,071	61,548	$220,998
Bricks	8,032	25,704	12,370	27,214
Sand	6,495	8,660	27,089	16,332
Wood	730	1,095	61	1,860
Cotton	306	47,320	361	49,225
Rice	141	1,987	160	3,299
Miscellaneous	7	335	26	1,325
Sheep, cattle, horses	74	7,000	453	13,975
Tar, rosin, turpentine	648	18,041	823	18,398
Sirup	24	936	61	2,120
Wool	1	210	2	458
Total	59,838	303,859	102,954	349,694
RECEIPTS.				
Merchandise	7,940	317,595	7,080	283,200
Grand total	67,778	621,454	110,034	632,894

Comparative statement of receipts and shipments for eight years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1890	27,808	$173,283	1894	242,464	$919,699
1891	45,521	201,061	1895	49,778	350,111
1892	50,054	354,684	1896	67,680	621,454
1893	30,284	429,126	1897	110,034	632,894

S 2.

IMPROVEMENT OF TICKFAW RIVER AND ITS TRIBUTARIES, LOUISIANA.

The primary project for the improvement of the Tickfaw River and its tributaries (the Natalbany, Blood, and Ponchatoula rivers) was adopted in 1881, and provided for the removal of obstructions from the streams, placing them in a clear and navigable condition as far as possible, at an estimated cost of $10,230.

Under this project the improvement was carried on from 1881 to February 5, 1895, with appropriations aggregating $10,000, resulting in the improvement of about 30 miles of the Tickfaw River and of its branches to the heads of navigation.

For detailed information as to the history of this work and its progress, see Annual Report of the Chief of Engineers for 1896, pages 1488–1489.

The total amount expended on the improvement to June 30, 1897, was $10,853.06.

On June 3, 1896, an appropriation of $1,000 was made for maintenance of this improvement. As the stream had been reported as clogged with aquatic plants, and a petition soliciting the removal of these water lilies had been forwarded to the Secretary of War by those interested, it was decided to remove them as far as possible with the funds on hand. After due advertisement, proposals were opened on December 30, 1896, and contract awarded to Mr. Henry Camors, of New

Orleans, La., for furnishing plant and crew for removing these plants at $28 per day. The contract was approved by the Chief of Engineers January 27, 1897. Work under this contract was commenced at the mouth of the river on February 26, 1897, and completed March 31, 1897, resulting in the improvement of about 2 miles by the removal of the water lilies or hyacinths. Although private parties had removed large quantities of these plants previous to the commencement of operations they were found in great profusion.

Where it was possible the hyacinths were detached from their anchorage and floated out into Lake Maurepas. When this was not practicable they were gathered up in skiffs and taken ashore or spread on bushes. No apparatus operating from a boat could be devised which would come within the limits of the appropriation, and for the reason that accessions are constantly being made by these plants drifting down from the effluents of the stream and finding lodgment, when they grow with astonishing rapidity. It is not believed that any better plan can be devised than to have a party go along the banks with long-handled rakes and pitchforks and throw the plants on the bank to wither and die.

The most economical method seems to be to patrol the banks of the stream and keep the plants in motion, or to throw them out on the bank: but with either method their complete eradication is not possible, as blockades will occur. It is even impossible to say, definitely, what the cost per mile for their removal would be, since my efforts to remove them seem to have been of little avail; for, after clearing out about 2 miles of the stream, at a cost of $960, the hyacinths again floated into the channel space and the condition was almost as bad in a short time as before operations were commenced.

Money statement.

July 1, 1896, balance unexpended	$1,123.86
June 30, 1897, amount expended during fiscal year	976.92
July 1, 1897, balance unexpended	146.94
Amount that can be profitably expended in fiscal year ending June 30, 1899. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	*1,000.00

Abstract of appropriations for improving Tickfaw River and tributaries, Louisiana.

By act of Congress—	
Approved March 3, 1881	$2,000
Passed August 2, 1882	2,000
Approved August 5, 1886	2,000
Of August 11, 1888	1,000
Approved September 19, 1890	1,000
Approved July 13, 1892	1,000
Passed August 18, 1894	1,000
Passed June 3, 1896	1,000
Total	11,000

*The estimate submitted is for maintenance, $1,000 being required annually.

Abstract of proposals for hire of boat for improving Tickfaw River, Louisiana, opened December 30, 1896, by Maj. James B. Quinn, Corps of Engineers.

No.	Name and address of bidder.	Amount of bid.
1	Henry Camors, New Orleans, La	$28
2	Harrison P. Dillworth, New Orleans, La	55
3	John J. Keegan, New Orleans, La	27
4	Charles H. Smith, New Orleans, La	40
5	Peter Usner, New Orleans, La	43

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	5
Trips	400
Net registered tonnage (400 trips)	13,793
Schooners	20
Trips	251
Net registered tonnage (251 trips)	5,702
Total vessels	25
Total trips	651
Total net registered tonnage (651 trips)	19,495

Draft of heaviest vessel—light, 5 feet; loaded, 6.6 feet.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Wood	3,888	$7,776	2,988	$7,470
Lumber	63,712	223,520	49,880	166,180
Brick	3,125	8,750	1,250	2,750
Cotton	346	38,000	121	16,310
Miscellaneous	.....	.....	38	2,140
Total	71,071	278,046	54,277	194,850
RECEIPTS.				
Merchandise	1,180	75,200	3,838	141,520
Grand total	72,251	353,246	58,115	336,370

Comparative statement of receipts and shipments for six years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1892	11,407	$102,116	1895	23,384	$220,566
1893	13,994	169,643	1896	72,851	353,246
1894	40,003	251,774	1897	58,115	336,370

NOTE.—Vessels go up the Tickfaw, Natalbany, and Pontchatoula rivers 24 miles to Wadesboro. There is good navigation all the way except near Springfield, where fallen trees and saw logs are forming dangerous impediments.

S 3.

IMPROVEMENT OF AMITE RIVER AND BAYOU MANCHAC, LOUISIANA.

The original project for this improvement was adopted in 1880 and modified in 1883, and under this project and modification the work was continued to May 31, 1895, with the various appropriations made amounting to $28,800, resulting in the improvement of the river and bayou from the mouth of Wards Creek to the mouth of the Amite River by the removal of obstructions, and by dredging of a turning basin for boats at the mouth of Wards Creek on Bayou Manchac.

The total amount expended on the improvement to June 30, 1896, was $28,473.63.

For details as to history and progress of the work since the commencement of the improvement see appendix R, Annual Report of Chief of Engineers for 1896, pages 1490 and 1491.

An appropriation of $2,500 was made by river and harbor act of June 3, 1896, but nothing has been done with the funds thus far, but they will probably be expended in the removal of obstructions which have formed since the work done in 1895.

There was expended during the fiscal year ending June 30, 1897, the sum of $16.67.

Money statement.

July 1, 1896, balance unexpended	$2,826.37
June 30, 1897, amount expended during fiscal year	16.67
July 1, 1897, balance unexpended	2,809.70
July 1, 1897, outstanding liabilities	4.50
July 1, 1897, balance available	2,805.20
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	*2,500.00

Abstract of appropriations for improving Amite River and Bayou Manchac, Louisiana.

By act of Congress—	
Approved June 14, 1880	$8,000
Approved March 3, 1881	5,000
Approved August 5, 1886	2,000
Of August 11, 1888	5,000
Approved September 19, 1890	3,800
Approved July 13, 1892	2,500
Of August 18, 1894	2,500
Passed June 3, 1896	2,500
Total	31,300

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	6
Trips	425
Net registered tonnage (425 trips)	30,517
Schooners	41
Trips	163
Net registered tonnage (163 trips)	3,572
Barges	35
Net tonnage (35 trips)	1,750
Total vessels	50
Total trips	618
Total tonnage (618 trips)	35,839

Draft of heaviest vessel—light, 6 feet; loaded, 7 feet.

*The estimate submitted is for maintenance, $2,500 being required annually.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Lumber, shingles, laths	45,081	$155,404	34,474	$107,977
Wood	5,062	10,124	4,898	11,754
Staves	1,028	18,636	1,035	30,862
Sugar and molasses	221	15,345	90	3,146
Cotton and cotton seed	928	104,480	1,630	137,602
Miscellaneous	79	2,096	80	6,042
Total	52,399	306,085	42,207	297,383
RECEIPTS.				
Merchandise	2,704	108,160	7,302	219,060
Grand total	55,103	414,245	49,509	516,443

Comparative statement of receipts and shipments for eight years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1890	84,295	$291,967	1894	157,902	$796,305
1891	17,792	300,963	1895	42,983	491,216
1892	18,530	334,061	1896	55,103	414,245
1893	22,099	346,257	1897	49,509	516,443

S 4.

IMPROVEMENT OF BAYOU LA FOURCHE, LOUISIANA.

The original project for this improvement was adopted in 1879, and work was carried on with the various appropriations, amounting to $30,000, to 1888, since which time the improvement has been carried on under the project of Lieut. O. T. Crosby, dated June 11, 1886. The results obtained have been of vast benefit to the commerce involved, over 100 miles of channel having been improved by the removal of obstructions and by dredging. Up to June 30, 1896, the sum of $168,857.92 has been expended on this improvement.

For detailed information see Appendix R, Annual Report of the Chief of Engineers for 1896, pages 1493 and 1494.

The work on this improvement during the past fiscal year consisted in the continuation of dredging operations to maintain low-water navigation in the bayou, under contract with Mr. Henry Camors, of New Orleans, La., approved June 16, 1896, for furnishing a dredge at $49 per day of eight hours.

Under date of July 3, 1896, the contractor submitted a proposition for the hire of his dredge for an additional eight hours per day, at contract price, and to furnish a double crew as required by the regulations. This proposition was accepted and approved by the Chief of Engineers on August 3, 1896, the time covered by the agreement to be three months from September 1, 1896.

Work was commenced on the bar at the head of the bayou on July 6, 1896, and was continued down the bayou to a point about 3 miles above Thibodeaux, resulting in the improvement of about 38 miles by dredging and removal of obstructions.

Operations under the contract were discontinued on February 13, 1897, there having been removed during the progress of the work

135,510 cubic yards of material, 34 logs, 6 wrecks, 8 snags, 2 stumps and several log jams caused by flatboat wrecks gathering the drift.

These operations have greatly benefited the commerce of the bayou, giving sufficient water for the navigation of the bayou during the entire low-water season, at which time the planters are generally laying in their supplies of coal and exporting their crops of sugar, molasses, etc.

A project was approved September 23, 1896, modifying Lieutenant Crosby's project of 1886, providing that the lock matter be held in suspension and operations be restricted to dredging to maintain low-water navigation. The estimated cost of this new project was $25,000 per annum.

The amount expended during the past fiscal year was $16,129.98, and the total to June 30, 1897, amounted to $184,987.90.

Money statement.

July 1, 1896, balance unexpended	$76,142.08
June 30, 1897, amount expended during fiscal year	16,129.98
July 1, 1897, balance unexpended	60,012.10
July 1, 1897, outstanding liabilities	80.10
July 1, 1897, balance available	59,932.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	*25,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriations for improving Bayou La Fourche, Louisiana.

By act of Congress—	
Approved June 18, 1878	$10,000
Approved March 3, 1879	10,000
Approved June 14, 1880	5,000
Approved July 5, 1884	5,000
Of August 11, 1888	50,000
Approved September 19, 1890	50,000
Approved July 13, 1892	50,000
Of August 18, 1894	40,000
Passed June 3, 1896	25,000
Total	245,000

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	24
Trips	541
Net registered tonnage (541 trips)	85,311
Luggers	5
Trips	7
Net tonnage (7 trips)	122
Barges	122
Trips	122
Net tonnage (122 trips)	84,638
Total vessels	151
Total trips	670
Total tonnage (670 trips)	170,171

Draft of heaviest steamer—light, 3 feet; loaded, 9 feet. Draft of heaviest barge—light, 18 inches; loaded, 8 feet.

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*The estimate submitted is for maintenance, $25,000 being required annually.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Sugar	44,606	$3,143,209	45,729	$2,551,972
Molasses	20,158	439,917	28,253	256,848
Rice	4,107	69,447	2,243	62,312
Potatoes and onions	7,723	178,451	5,260	164,377
Eggs	218	21,154	175	17,529
Moss	431	17,263	303	12,780
Pecans	3	420	8	1,224
Miscellaneous	347	28,115	199	13,084
Total	77,593	3,897,976	82,170	3,080,076
RECEIPTS.				
Miscellaneous	32,688	1,306,381	54,302	1,625,929
Coal	119,610	425,280	80,820	282,870
Grand total	229,891	5,629,637	217,292	4,988,875

Comparative statement of receipts and shipments for eight years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1890	200,746	$5,709,382	1894	273,686	$8,842,942
1891	217,273	8,244,225	1895	263,607	9,224,554
1892	171,885	5,660,662	1896	229,891	5,629,237
1893	212,476	7,422,285	1897	217,292	4,988,875

S 5.

IMPROVEMENT OF BAYOU PLAQUEMINE, GRAND RIVER, AND PIGEON BAYOUS, LOUISIANA.

For convenience of reference and noting progress of work, the operations under this improvement are divided into subheadings.

The original project, adopted in 1885, contemplated only the dredging and cleaning out of Bayou Plaquemine and the building of a lock at the head of the bayou.

The bank-protection work was made a part of the improvement in 1886, but on account of lack of funds was transferred to the Fourth District of the Mississippi River Commission in May, 1889, and was retransferred to this office on September 28, 1894, after the work had been completed.

By act of July 13, 1892, the improvement of Grand River and Pigeon bayous was made a part of this improvement.

For a history of the improvement and details of the work done under it in its various branches, up to and including June 30, 1896, with the appropriations amounting to $460,000, see Appendix R, Annual Report of the Chief of Engineers for 1896, pages 1496 to 1500.

GRAND RIVER, AND PIGEON BAYOUS.

With the allotment of $10,000 from the appropriation made June 3, 1896, for continuing improvement, to be used in the improvement of Grand River and Pigeon bayous, part of the Plaquemine all-water route, this work was advertised, and bids for furnishing dredge were opened December 30, 1896. Five bids were received, and they ranged from $37.90 to $90 per day of eight hours.

The contract was awarded to Mr. Harrison P. Dilworth, of New Orleans, La., the lowest bidder, to furnish a dredge at the rate of $37.90 per day of eight hours. Contract was entered into January 2[illegible] 1897, approved February 1, 1897, and operations under the contract were commenced March 26, 1897.

Up to June 30, 1897, 38,635 cubic yards of material have been dredged 1,700 stumps and snags, 33 overhanging trees, and many logs have been removed.

BANK-PROTECTION WORK.

The caving in the bank at the mouth of the bayou, which was reported on September 5, 1896, has not reached an extent sufficient to make it serious. The funds allotted for the preservation of the work are being held to repair any damage which may result from the present high water, the extent of which it will be impossible to ascertain until the flood in the Mississippi River subsides.

PLAQUEMINE LOCK.

Under this part of the improvement, work was continued during the past fiscal year under contract entered into with Mr. E. A. Burriss, of New Orleans, La., under date of June 24, 1895. The contractor has been rather unfortunate, however, having met with many obstacles which could not have been foreseen. A severe storm in June, 1896, washed a large part of the excavated material back into the pit, and caused other damage. In August, 1896, the assistant engineer superintending this work reported a dangerous movement in the slopes at the end of the pit near the river and in the market house, which threatened the safety of the buildings unless arrested at once. He stated that a crack 8 inches wide had developed alongside the market house, and that the pavement through the center of the building had opened 1 inch at the joint. This movement drove a great deal of the sheet piling so badly out of line that it will have to be pulled up and redriven, and has also rendered necessary the excavation of 60,000 cubic yards of material not contemplated in the contract.

On January 21, 1897, authority was requested to make a supplemental contract at regular contract prices for removing this material. This authority was given by the Chief of Engineers on February 12, 1897, and a supplemental contract was entered into in accordance therewith and same was approved February 27, 1897.

When the movement of the slopes at the end of the pit was reported by the assistant engineer, the contractor was ordered to at once discontinue dredging inside the cofferdam and to redrive and brace the sheet piling.

Three extensions have been granted the contractor, one from July 20, 1896, to January 31, 1897, one from January 31, 1897, to June 30, 1897, and one from June 30, 1897, to October 1, 1897.

Under the original contract thirty-one fiftieths of the piles for the foundation of the lock have been driven. Under the supplemental contract 40,850 cubic yards of material have been excavated.

There has been expended on this improvement to June 30, 1897, the sum of $396,025.40.

Owing to the extraordinarily high water of this year, a complete reconstruction of the lock plans has become necessary, and these are not quite ready for consideration, but will be very shortly. So soon as approved a contract for the completion of the lock will be awarded under the provisions of the continuing contract system contained in the act of June 3, 1896.

Money statement.

uly 1, 1896, balance unexpended		$120,587.24
mount appropriated by sundry civil act approved June 4, 1897		350,000.00
		470,587.24
une 30, 1897, amount expended during fiscal year		36,612.64
uly 1, 1897, balance unexpended		433,974.60
uly 1, 1897, outstanding liabilities	$16,364.86	
uly 1, 1897, amount covered by uncompleted contracts	29,893.85	
		46,258.71
uly 1, 1897, balance available		387,715.89
Amount (estimated) required for completion of existing project		878,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1899		400,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.		

Abstract of appropriations for improving Bayou Plaquemine, Louisiana.

By act of Congress—	
Of August 11, 1888	$100,000
Approved September 19, 1890	100,000
Approved July 13, 1892	150,000
Of August 18, 1894	110,000
Of June 3, 1896	20,000
Sundry civil act, approved June 4, 1897	350,000
Total	830,000

Abstract of proposals for hire of dredge for improving Grand River and Pigeon bayous, Louisiana, opened December 30, 1896, by Maj. James B. Quinn, Corps of Engineers.

No.	Name and address of bidder.	Amount.
1	Harrison P. Dilworth, New Orleans, La	a $37.90
2	Joseph Vance Higbee, New Orleans, La	39.50
3	Woodward, Wight & Co., New Orleans, La	44.75
4	Henry Camors, New Orleans, La	39.85
5	Rittenhouse Moore Dredging Co., Mobile, Ala	90.00

a Lowest bid.

List of contracts now in force for improving Bayou Plaquemine, Louisiana.

For cofferdam, excavation, and piling foundation for lock: Name of contractor, E. A. Burriss, New Orleans, La.; date of approval, July 1, 1895; work commenced on September 1, 1895; work to be completed October 1, 1897.

For dredging in Grand River, and Pigeon bayous, Louisiana: Name of contractor, Harrison P. Dilworth, New Orleans, La.; date of approval, February 1, 1897; work commenced on March 26, 1897; work to be completed on or before December 31, 1897.

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	4
Trips	191
Net registered tonnage (191 trips)	7,326
Barges	3
Trips	80
Net tonnage (80 trips)	3,200
Total vessels	7
Total trips	271
Total net tonnage (271 trips)	10,526

Draft of heaviest vessel—light, 2.5 feet; loaded, 4 feet.

S 7.

IMPROVEMENT OF BAYOU TECHE, LOUISIANA.

The first work on this improvement was commenced with the appropriation made in 1886, and the work had been continued to May 1, 1895, with the various appropriations made from time to time, amounting to $61,000.

The improvement has been of great importance to commerce by the removal of obstructions and dredging of shoal places for a distance exceeding 70 miles.

For details as to history, progress, and general results obtained by the work done, see Appendix R, Annual Report of the Chief of Engineers for 1896, pages 1503 and 1504.

Under the appropriation of $10,000, made by act of June 3, 1896, specifications were prepared and advertisement duly inserted calling for proposals for furnishing a dredge for continuing this improvement. Two proposals were received and opened, September 30, 1896, and the contract was awarded to the lowest bidder, Joseph Vance Higbee, of New Orleans, La.—for furnishing dredge, at the rate of $45.25 per day of eight hours. Contract was entered into October 12 and approved October 27, 1896.

A proposal was submitted by the contractor to work his dredge an additional eight hours per day during the continuation of the contract at regular contract prices for the additional time, he furnishing a double crew as required by the regulations. The acceptance of this proposition was approved by the Chief of Engineers on November 16, 1896.

Operations were commenced under contract on November 18, 1896, and continued until March 22, 1897, resulting in the improvement of about 44½ miles, by the removal of 64,593 cubic yards of material and 1,665 obstructions, consisting of overhanging trees, limbs, sunken logs, snags, wrecks, etc. A channel 60 feet wide and averaging 5 feet in depth was secured.

There has been expended on this improvement to June 30, 1897, the sum of $70,579.67.

Money statement.

July 1, 1896, balance unexpended	$10,027.44
June 30, 1897, amount expended during fiscal year	9,607.11
July 1, 1897, balance unexpended	420.33

Abstract of appropriations for improving Bayou Teche, Louisiana.

By act of Congress—	
Approved July 11, 1870	$17,500
Approved June 14, 1880	6,000
Approved March 3, 1881	20,000
Approved July 5, 1884	6,500
Approved September 19, 1890	5,000
Passed August 18, 1894	6,000
Passed June 3, 1896	10,000
Total	71,000

Abstract of proposals for hire of dredge for improving Bayou Teche, Louisiana, opened by Maj. James B. Quinn, September 30, 1896.

No.	Name and address of bidders.	Price bid per day of eight hours.
1	Henry Camors, New Orleans, La	$46.00
2	Harrison P. Dilworth, New Orleans, La	58.00
3	Joseph Vance Higbee, New Orleans, La	45.25

Contract awarded to Joseph Vance Higbee, the lowest bidder. Contract approved October 27, 1896. Work was commenced November 18, 1896, and completed March 22, 1897.

There is now no contract in force for this improvement.

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	25
Trips	1,008
Net registered tonnage (1,008 trips)	91,710
Barges	145
Trips	597
Net tonnage (597 trips)	106,323
Total vessels	170
Total trips	1,605
Total tonnage	198,033

Draft of heaviest vessel—light, 2½ feet; loaded, 8 feet.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Sugar	35,409	$2,964,179	40,262	$2,498,192
Molasses	3,513	77,749	2,424	37,541
Rice	338	5,817	225	10,518
Moss	38	1,110	68	2,734
Pecans	5	612	18	726
Hides	15	1,770	20	3,535
Cotton and seed	468	10,910	5,043	228,315
Cotton-seed oil	115	6,420	188	11,992
Wood	7,236	21,670	5,247	5,247
Miscellaneous	7,236	21,670	25,381	135,976
Total	54,363	3,111,907	78,976	2,934,776
RECEIPTS.				
Machinery, merchandise, coal, saw logs, etc	239,322	1,157,788	224,053	1,168,948
Grand total	293,685	4,269,695	303,029	4,103,724

Increase, 1897 over 1896, 9,344 tons.

Comparative statement of receipts and shipments for seven years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1891	26,905	$1,715,026	1895	279,923	$5,794,483
1892	64,866	833,110	1896	293,685	4,269,695
1893	115,080	5,754,542	1897	303,029	4,103,724
1894	383,154	7,378,789			

S 8.

IMPROVEMENT OF CHANNEL, BAY, AND PASSES OF BAYOU VERMILION, LOUISIANA.

The first project under this improvement was approved in 1892, and provided for the removal of obstructions in the bayou and the marking of the channel in the bay with guide piles, the estimated cost of the work being placed at $25,000.

Under this project work was carried on from December 1, 1892, to August 27, 1895, with the various appropriations made from time to time, amounting to $12,500, resulting in the marking of the channel through the bay with guide piles and the removal of obstructions from a point 18 miles above the mouth of the bayou to a point 26 miles above Abbeville, La.

There was expended on this improvement to June 30, 1896, the sum of $12,365.63.

For details as to history, progress of the work, and general results obtained by the improvement, see Appendix R, Annual Report of Chief of Engineers for 1896, pages 1505 and 1506.

Nothing has been done during the past fiscal year with the funds appropriated June 3, 1896, but this amount will probably be used in removing obstructions in the bayou which have formed since the completion of the operations in August, 1895.

There was expended during the fiscal year ending June 30, 1897, the sum of $21.95.

Money statement.

July 1, 1896, balance unexpended	$1,134.37
June 30, 1897, amount expended during fiscal year	21.95
July 1, 1897, balance unexpended	1,112.42
Amount (estimated) required for completion of existing project	11,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	11,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of appropriations for improving channel, bay, and passes of Bayou Vermilion, Louisiana.

By act of Congress—	
Approved July 13, 1892	$7,500
Passed August 18, 1894	5,000
Passed June 3, 1896	1,000
Total	13,500

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	9
Trips	191
Net registered tonnage (191 trips)	13,561
Barges	11
Trips	227
Net tonnage (227 trips)	22,700
Schooners	5
Trips	5
Net registered tonnage (5 trips)	134
Total vessels	18
Total trips	423
Total net tonnage (423 trips)	36,395

Draft of heaviest vessel—light 2½ feet; loaded, 5 feet.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
Lumber	.....	.....	120	$7,200
Rice	5,365	$87,012	278	9,123
Cotton	508	76,897	959	132,150
Cotton seed	586	5,860	1,513	21,104
Wood	1,260	1,920	990	1,575
Cattle	65	6,935	88	5,016
Sugar	1,696	124,732	1,242	74,510
Merchandise	1,012	40,480	829	31,140
Molasses	330	1,300	107	1,074
Coal	2,200	10,000	.....	.....
Total	13,022	355,136	6,126	282,892

NOTE.—The yield of rice and sugar not being equal to that of last year accounts for the difference in tonnage and value.

Comparative statement of receipts and shipments for five years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1893	85,671	$1,227,365	1896	13,022	$355,136
1894	43,822	923,777	1897	6,126	282,892
1895	12,993	429,172			

No new lines of transportation were established during the year.

S 9.

IMPROVEMENT OF MERMENTAU RIVER AND TRIBUTARIES, LOUISIANA.

The first work done upon this improvement was commenced December 8, 1892, and carried on from the lower end of Lake Arthur up the Mermentau River, a distance of 38 miles of channel being improved by the removal of 556 obstructions.

For detailed information as to history and progress of this work, see pages 1507–1508, Annual Report of the Chief of Engineers for 1896.

No work was done during the past year.

A project was approved June 15, 1897, for the application of the funds now available in the construction of brush dams in Mud Lake to obtain a channel 50 feet wide and 6 feet deep, aided by dredging to secure immediate results. This work will be prosecuted during the next year.

There has been expended on this improvement to the close of the year ending June 30, 1897, the sum of $7,312.07.

Money statement.

July 1, 1896, balance unexpended	$10,378.58
June 30, 1897, amount expended during fiscal year	190.65
July 1, 1897, balance unexpended	10,187.93
Amount (estimated) required for completion of existing project	6,115.25
Amount that can be profitably expended in fiscal year ending June 30, 1899	6,115.25

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriations for improving Mermentau River and tributaries, Louisiana

By act of Congress—	
Approved July 13, 1892	$7,5[illegible]
Passed August 18, 1894	5,[illegible]
Passed June 3, 1896	5,[illegible]
Total	17,5[illegible]

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	[illegible]
Trips	[illegible]
Net registered tonnage (295 trips)	14,[illegible]
Barges	[illegible]
Trips	[illegible]
Net tonnage (146 trips)	5,8[illegible]
Schooners	[illegible]
Trips	[illegible]
Net registered tonnage (47 trips)	1,2[illegible]
Total vessels	[illegible]
Total trips	[illegible]
Total net tonnage	21,[illegible]

Draft of heaviest vessel, light, 3 feet; loaded, 5.7 feet.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
Cotton and cotton seed	.....	.....	858	$49,[illegible]
Rice	7,745	$113,365	4,935	165,[illegible]
Lumber	3,360	9,940	910	3,[illegible]
Wood	3,194	3,992	4,300	10,[illegible]
Merchandise	2,160	79,480	1,207	49,[illegible]
Total	16,459	206,777	12,210	278,[illegible]

Comparative statement of receipts and shipments for five years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1893	16,250	$324,900	1896	16,459	$206,777
1894	5,437	188,950	1897	12,210	278,236
1895	15,955	300,163			

S 10.

IMPROVEMENT OF MOUTH AND PASSES OF CALCASIEU RIVER, LOUISIANA.

The first record regarding this improvement is that a channel 8 feet deep, 70 feet wide, and 7,500 feet long was cut through the bars in Calcasieu Pass in 1874, 1882, and 1883, under contract; that the channel shoaled and was redredged in 1885; that a contract was made in 1886 for building a revetment on each side of a channel 100 feet wide and about 1,000 feet in length for the purpose of protecting this channel, and further, of dredging a channel 6 feet deep and 100 feet wide through the bars at the mouth of Calcasieu River.

The revetment was only partially completed, owing to the death of the contractor and the failure on the part of his successor to carry out the work, and a new project was approved January 12, 1888, providing for the omission of the revetment.

Major Heuer's project of 1886, confirmed by Capt. W. L. Fisk in 1888, as adopted in 1890, and work under it was carried on to August 1, 1894.

The project under which the work is being conducted at present was pproved August 17, 1894, and work under it has been continued since t intervals, the jetty work being done under contract, and dredging ith the Government dredge and hired labor.

The total amount of appropriations for this work to June 30, 1897, as $401,500, and the amount expended to same date was $386,612.77.

The work on this improvement during the past fiscal year consisted n the completion of the contract of Mr. Winches, of Velasco, Tex., for xtending the east jetty.

Work under the contract was continued from May 1, 1896, to August 4, 1896, the materials used consisting of 3,888.90 square yards of brush mattress, 4,994.10 tons of riprap hearting stone, and 557.13 tons of granite capping blocks, giving the east jetty on completion a total length of 7,847 feet.

Under the appropriation of June 3, 1896, contract for the building of the west jetty was entered into with Messrs. Charles Clarke & Co., of Galveston, Tex., at the rate of 91 cents per square yard for brush mattress, $2.80 per ton for riprap hearting stone, and $4.50 per ton for granite capping blocks, the total amount of contract reaching about $70,000. The contract was entered into October 19, 1896, and approved November 17, 1896, and work under it commenced January 1, 1897, and was completed June 15, 1897, resulting in the construction of 2,200 feet of the west jetty, 1,275 linear feet of which having been completed and capped and 875 linear feet brought up to mean high water and ready for capping. The remainder, 100 feet, is foundation work only.

The material used in this work consisted of 13,122.25 square yards of brush mattress, 17,517.41 tons of riprap stone, and 1,995.88 tons of granite capping blocks.

From a recent survey the depth on the bar at the outer pass is 7 feet at mean low water. There is an available depth through the channel in the lake of about 6 feet.

Money statement.

July 1, 1896, balance unexpended	$105,954.14
June 30, 1897, amount expended during fiscal year	91,066.91
July 1, 1897, balance unexpended	14,887.23
July 1, 1897, outstanding liabilities	7.50
July 1, 1897, balance available	14,879.73
Amount (estimated) required for completion of existing project	255,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	255,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriations for improving mouth and passes of Calcasieu River, Louisiana.

By act of Congress—	
Approved June 10, 1872	$15,000
Approved March 3, 1881	15,000
Passed August 2, 1882	10,000
Approved July 5, 1884	6,500
Of August 11, 1888	10,000
Approved September 19, 1890	75,000
Approved July 13, 1892	100,000
Passed August 18, 1894	90,000
Passed June 3, 1896	80,000
Total	401,500

Abstract of proposals for construction of west jetty, mouth and passes of Calcasieu River, Louisiana, opened by Maj. James B. Quinn, September 30, 1896.

No.	Name and address of bidder.	13,000 square yards brush mattresses, per square yard.	15,000 tons riprap hearting stone, per ton.	2,000 tons granite capping stone, per ton.	Total
1	Gulf Towing Co., Velasco, Tex	$1.00	$2.90	$4.25	$65 [illegible]
2	John A. Davis, Galveston, Tex	1.05	3.25	4.50	71 [illegible]
3	Charles Clarke & Co., Galveston, Tex	.91	2.80	4.50	62 [illegible]

Contract awarded to Charles Clarke & Co., the lowest bidders. Contract approved November 17, 1896. Work was commenced on January 1, 1897, and completed June 15, 1897.

There are no contracts now in force for this work.

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	11
Trips	[illegible]
Registered tonnage (387 trips)	20,[illegible]
Barges	[illegible]
Trips	164
Net tonnage (164 trips)	24,[illegible]
Schooners	[illegible]
Trips	21[illegible]
Registered tonnage (218 trips)	8,21[illegible]
Total vessels	51
Total trips	76[illegible]
Total net tonnage (769 trips)	53,[illegible]

Draft of heaviest steamer, light, 7½ feet; loaded, 9 feet. Draft of heaviest schooner, light, 3½ feet; loaded, 6½ feet.

Receipts and shipments for two years.

Article.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
Lumber	185,293	$555,356	129,993	$433,[illegible]
Cotton	484	31,606	392	77,9[illegible]
Rice	222	7,030	83	8,6[illegible]
Merchandise	16,776	97,550	10,561	144,[illegible]
Total	202,775	691,542	141,029	664,[illegible]

Comparative statement of receipts and shipments for five years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1893	207,545	$2,141,750	1896	202,775	$691,542
1894	344,973	1,600,574	1897	141,029	664,[illegible]
1895	254,394	788,274			

Improving
Calcasieu River & Pass, La.
Calcasieu Pass.

Surveyed May 26th. to 30th. '97.

Under the direction of

Major James B. Quinn, Corps of Engineers, U.S. Army.

by

J. L. Brownlee, Asst. Engineer.

Scale of Feet.

2000' 0 2000' 4000'

S 11.

IMPROVEMENT OF HARBOR AT SABINE PASS, TEXAS.

Work of extending the east jetty was continued under contract from July 1, 1896, to September 15, 1896, resulting in the placing of 3,652.82 tons of granite riprap stone and 3,002.68 tons of granite capping blocks, giving this jetty a total length of 19,500 feet, of which 18,600 feet have been completed, 600 feet brought up to mean low water, the remaining 300 feet being foundation work. A number of capping blocks have been displaced.

The west jetty is 14,875 feet in length, 6,609 feet of which being raised to 2 feet above mean high water. The outer 300 feet is foundation work.

The channel between the jetties has an average width of 100 feet and a depth ranging from 20 to 27 feet. Only in one place was a depth of 20 feet found, but the bottom here is of very soft material, vessels finding no difficulty in navigating it drawing 22 feet.

The river and harbor act of June 3, 1896, authorized contracts to be entered into for such materials and labor necessary to complete the present project of improvement, limiting the cost to $1,050,000. Under this authorization contract was entered into with Christie & Lowe, of Chicago, Ill., May 10, 1897, and approved June 22, 1897, $985,000 to be expended in extending the jetties. The $65,000 remaining will be expended either in the addition of rock to the jetties as may become necessary during the progress of the work or in dredging between the jetties to improve the present channel. Operations are to be commenced within 60 days after approval of contract and the whole work completed by May 31, 1901.

The sundry civil act approved June 4, 1897, appropriated $350,000 for improvement under the continuous contract mentioned above, $100,000 for the purchase of a dredge boat, and $30,000 for operating same during the fiscal year ending June 30, 1898.

The project for the expenditure of the $350,000 was approved June 25, 1897, and work will probably be commenced early in August next.

A project for procuring a suction dredge under the $100,000 appropriated therefor was approved June 29, 1897.

There has been expended on this improvement to June 30, 1897, since the commencement of work, the sum of $2,042,243.51.

For history of this work and detailed information relative to the improvements made, see Annual Report of the Chief of Engineers for 1896, pages 1512 to 1514.

Money statement.

July 1, 1896, balance unexpended		$111,207.98
Amount appropriated by sundry civil act approved June 4, 1897		480,000.00
		591,207.98
June 30, 1897, amount expended during fiscal year		38,701.49
July 1, 1897, balance unexpended		552,506.49
July 1, 1897, outstanding liabilities	$132.51	
July 1, 1897, amount covered by uncompleted contracts for fiscal year 1898	*350,000.00	
		350,132.51
July 1, 1897, balance available		202,373.98
Amount (estimated) required for completion of existing project		1,028,856.50
Amount that can be profitably expended in fiscal year ending June 30, 1899		400,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

* The approved continuous contract calls for the expenditure of $1,050,000.

Abstract of appropriations for improving harbor at Sabine Pass, Texas.

From act approved August 30, 1852 (survey)	$5,0
Allotted from act approved June 10, 1873 (for survey)	2,0
By act of Congress—	
Approved March 3, 1875	20,0
Approved August 14, 1876	3
Approved June 18, 1878 (allotted)	30,0
Approved March 3, 1879	25,0
Approved June 14, 1880	50,0
Approved March 3, 1881	15
Passed August 2, 1882	150,
Approved July 5, 1884	20
Approved August 5, 1886	19
Of August 11, 1888	250,0
Approved September 19, 1890	300,
Approved July 13, 1892	350,0
Passed August 18, 1894	*271,
Passed June 3, 1896	75,0
Sundry civil act approved June 4, 1897	480,0
Total	2,594,

Abstract of proposals for extension of jetties and for dredging for improving harbor at Sabina Pass, Tex., opened by Maj. James B. Quinn, April 15, 1897.

No.	Name and address of bidder.	160,000 square yards brush mattress, per square yard.	300,000 tons rip-rap stone, per ton.	35,000 tons granite capping stone, per ton.	500,000 cubic yards dredging, per cubic yard.	Total
1	Gardner Contracting Co., New Orleans, La	$1.00	$2.35	$3.45	$0.08½	$1,02
2	M. J. Fenton, New York, N. Y	1.20	2.15	2.85	.35	1,11
3	Christie & Lowe, Chicago, Ill	.68	1.67	3.80	.10	7
4	Alabama Dredging and Jetty Co., Mobile, Ala	.90	2.50	4.10	.13	1,1
5	Ricker, Lee & Co., Galveston, Tex	.99	2.46	4.25	.13	1,1
6	Chas. Clarke & Co., Galveston, Tex.	.65	2.09	3.60	.09	9
7	Frank Perry, Houston, Tex	.70	2.15	3.60	.11	9
8	Burkitt & Burns, Palestine, Tex	.75	2.32	3.58	.13	1,0
9	McArthur Bros. Co., Chicago, Ill	.95	2.25	3.90	.12	1,0
10	Wm. T. Gaynor, Fayetteville, N. Y	.67	2.07	3.40	.08	8

Award of contract made to Christie & Lowe, of Chicago, Ill., the lowest bidder.

Contract now in force for improving harbor at Sabine Pass, Tex.

For extension of jetties and for dredging under the continuing contract system. Name of contractors, Christie & Lowe, Chicago, Ill.; date of approval, June 1897; work to be commenced within sixty days after approval of contract in the case of the jetty work; dredging to be commenced within thirty days after notification to the contractor that dredging is required; the entire work under the contract to be completed on or before May 31, 1901.

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Vessels	
Trips	4
Net registered tonnage (403 trips)	104,3

The steamship *Westmeath*, 4,436 tons, was the largest vessel to load at Sabine Pass. This steamship draws 16.4 feet light, has a maximum draft of 26.8 feet, and was loaded to 23.6 feet.

*The total amount of this appropriation was originally $275,000, but of this sum $4,000 was allotted by sundry civil act of March 2, 1895, for dredging of a bar across the mouth of Sabine River, Texas, and was expended under that improvement.

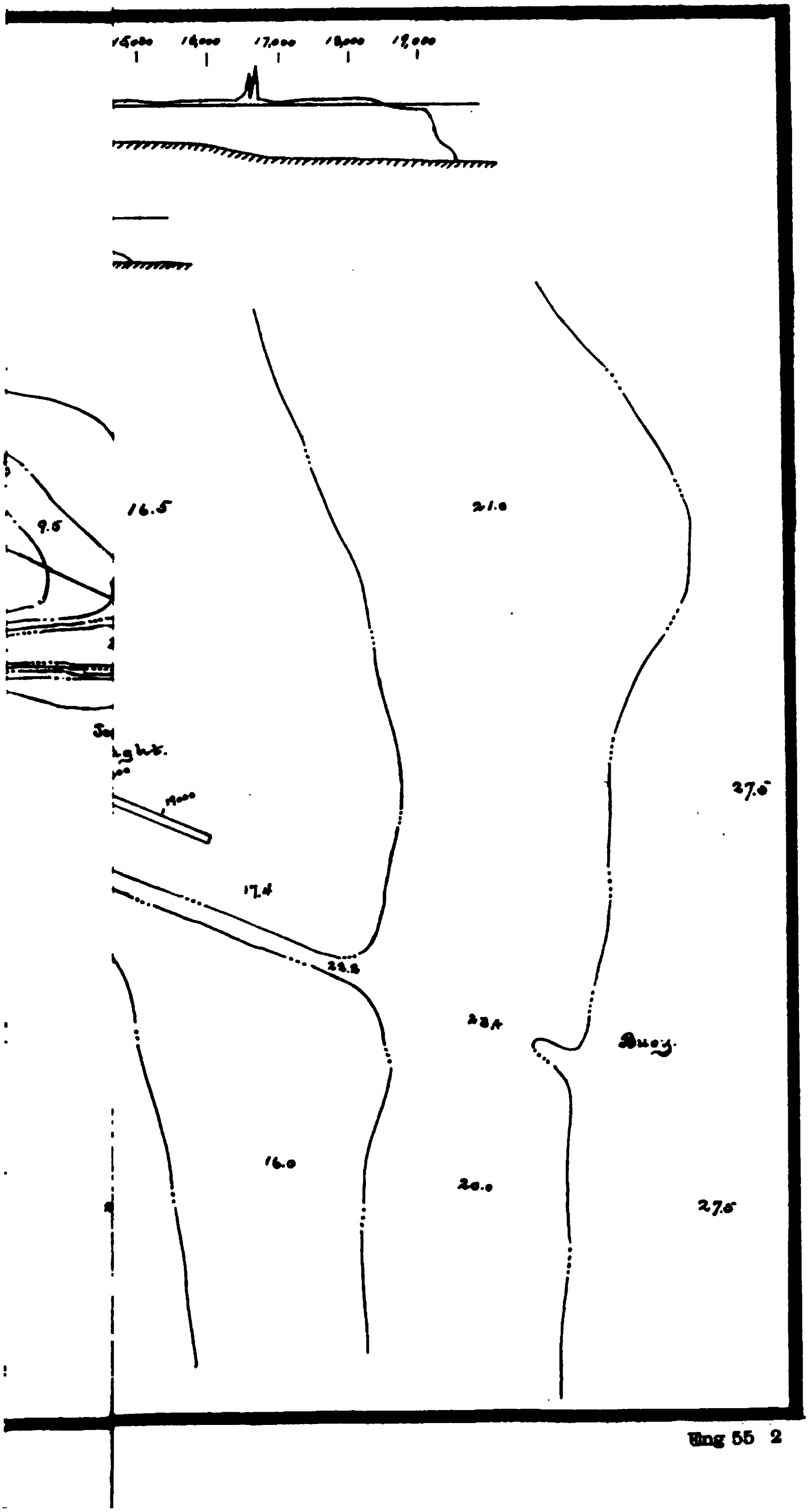
16,000
17,000
18,000
19,000
16.5
21.0
9.5
Lt.
Lt.
19.00
17.4
27.6
Buoy.
16.0
20.0
27.6

Fig 55 2

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value.
SHIPMENTS.				
Lumber	45,221	$172,681	80,953	$433,213
Merchandise	240	11,975	33	3,150
Total	45,461	184,656	80,986	436,363
RECEIPTS.				
Rock	1,009	1,886	4,520	8,626
Coal	580	2,610	1,542	6,939
Merchandise	1,836	9,890	584	23,360
Grand total	48,886	199,042	87,632	475,288

Comparative statement of receipts and shipments for six years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1892	38,028	$225,963	1895	47,691	$252,823
1893	15,050	180,950	1896	48,886	199,042
1894	40,966	290,189	1897	87,632	475,288

Comparative statement of tonnage and value for the past two years.

Year ending May 31—	Tons.	Value.
1897	87,632	$475,288
1896	48,886	199,042
Increase	38,746	276,246

S 12.

IMPROVEMENT OF SABINE RIVER, TEXAS.

No work was done on this stream during the year just closed. For details of the improvement and history of this work, see pages 1515 to 1517, Annual Report of the Chief of Engineers for 1896.

From an examination recently made the dams built in 1890 were found to be in good condition, and that part of the stream cleared in 1895 was also found to be well preserved.

The principal work remaining to be done is to clear the stream of obstructions from Morgans Bluff to the head of the Narrows, a project for which was approved June 9, 1897. The work will be commenced in the coming year and carried on as far as the available funds will permit.

The total expended on this improvement to June 30, 1897, amounted to $48,573.77.

Money statement.

July 1, 1896, balance unexpended	$2,139.38
June 30, 1897, amount expended during fiscal year	13.15
July 1, 1897, balance unexpended	2,126.23
Amount that can be profitably expended in fiscal year ending June 30, 1899 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	*2,000.00

* The estimate submitted is for maintenance, $2,000 being required annually.

Abstract of appropriations for improving Sabine River, Texas.

Allotted from act approved June 10, 1872	$5
By act of Congress—	
Approved June 18, 1878	1
Approved March 3, 1879	
Approved June 14, 1880	
Approved March 3, 1881	
Passed August 2, 1882	
Approved July 13, 1892	
Passed August 18, 1894	
Passed June 3, 1896	
Total	45
Amount allotted from appropriation of $275,000 for improving harbor at Sabine Pass, Tex., by sundry civil act of March 2, 1895, and expended under this appropriation	4
Total	50

The above amount was allotted for dredging bar across the mouth of Sabine P from the appropriation dated August 18, 1894, for improving harbor at Sabine P Tex., and the work was done by the Government dredge and hired labor.

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	
Trips	
Net registered tonnage (486 trips)	19
Schooners	
Trips	
Net registered tonnage (47 trips)	1
Barges	
Trips	
Net tonnage (235 trips)	43
Total vessels	
Total trips	
Total tonnage (768 trips)	64,

Draft of heaviest vessel, light, 30 inches; loaded, 7 feet.

Receipts and shipments for two years.

Articles.	Year ending May 31—			
	1896.		1897.	
	Tons.	Value.	Tons.	Value
Lumber	265,591	$649,380	234,812	$68
Cotton	1,036	160,000	950	13
Staves	550	2,000	450	1
Wood	30	6,000	40	
Merchandise	4,050	162,000	9,112	34
Total	271,257	979,380	245,364	1,181

Comparative statement of receipts and shipments for five years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1893	146,863	$1,591,280	1896	271,257	$979,
1894	245,657	1,518,630	1897	245,364	1,181.
1895	182,738	736,044			

S 13.

IMPROVEMENT OF NECHES RIVER, TEXAS.

The project of 1895, providing for a channel 6 feet deep and 100 feet wide from deep water in the Neches River to deep water in Sabine Lake, having been completed in May, 1896, and as no further work was contemplated, authority was obtained to drop this work from the list of duties under this office.

For details of the work upon this stream and its history, see pages 1518, 1519, Annual Report of the Chief of Engineers for 1896.

Money statement.

July 1, 1896, balance unexpended	$127.30
June 30, 1897, amount expended during fiscal year	127.30

Abstract of appropriations for improving Neches River, Texas.

By act of Congress—	
Approved June 18, 1878	$8,000
Approved March 3, 1879	5,000
Approved June 14, 1880	3,000
Approved March 3, 1881	5,000
Passed August 2, 1882	5,000
Approved July 5, 1884	7,000
Total	33,000

COMMERCIAL STATISTICS.

[From June 1, 1896, to May 31, 1897.]

Steamers	2
Trips	18
Net registered tonnage (18 trips)	492
Barges	10
Trips	16
Net tonnage (16 trips)	4,320
Total vessels	12
Total trips	34
Total tonnage (34 trips)	4,812

Receipts and shipments for two years.

Articles.	1896.		1897.	
	Tons.	Value.	Tons.	Value.
Lumber	136,651	$303,525	135,289	$415,044
Merchandise	450	17,850	.....	.....
Rice	167	2,700	89	2,961
Total	137,268	324,075	155,378	418,005

Comparative statement of receipts and shipments for five years.

Year ending May 31—	Tons.	Value.	Year ending May 31—	Tons.	Value.
1893	77,533	$600,410	1896	137,268	324,075
1894	165,528	593,754	1897	135,378	418,005
1895	146,618	544,720			

S 14.

CLOSING CREVASSE IN PASS A LOUTRE, MISSISSIPPI RIVER.

An appropriation of $250,000 having been made by act of Febru 26, 1897, a project for the closure of the crevasse was submitted Ma 24, 1897, but has not as yet been approved.

The field work of a survey was completed on June 30, 1897.

Money statement.

Amount appropriated by act approved February 26, 1897	$250, 00
July 1, 1897, balance unexpended	250, 0
July 1, 1897, outstanding liabilities	1
July 1, 1897, balance available	249, 36

S 15.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERI NAVIGATION.

Wreck of barge in Lake Pontchartrain, Louisiana.—This wreck for an obstruction to navigation in Lake Pontchartrain, Louisiana, and removal was authorized by the Secretary of War January 12, 1897, a an allotment of $1,500 made therefor from the permanent indefi appropriation for removing sunken vessels or craft obstructing or end dering navigation.

Bids for this work were opened April 3, 1897, and award of contra was made to Mr. James Moore, of New Orleans, La., the lowest bidde

Work under this contract was commenced on May 5, 1897. The wo so far done has consisted in the removal of the sides and decking barge and the piling that had been driven by the owners in an attem to raise it. The bottom of barge yet remains to be removed.

Abstract of proposals for removing wreck of barge in Lake Pontchartrain, Louisia opened by Maj. James B. Quinn, April 3, 1897.

No.	Name and address of bidder.	Amo of b
1	Edward S. Sanson, New Orleans, La	$44
2	E. A. Conrad, New Orleans, La	4
3	Frank Beck, New Orleans, La	
4	Peter Usner, New Orleans, La	4
5	James Moore, New Orleans, La	34
6	John J. Keegan, New Orleans, La	4
7	John H. Gardner, New Orleans, La	6
8	Andre Fourchy, New Orleans, La	4

Contract awarded to James Moore, of New Orleans, La., the lowest bidder.

Contract for removing sunken vessels or craft obstructing or endangering navigation.

For removing wreck of barge in Lake Pontchartrain, Louisiana: Name of co tractor, James Moore; date of approval, May 1, 1897; date of beginning wor May 5, 1897; date of expiration, July 31,1897.

S 16.

PRELIMINARY EXAMINATION OF HOMOCHITTO RIVER, MISSISSIPPI, FROM MOUTH TO YAZOO AND MISSISSIPPI VALLEY RAILROAD.

[Printed in House Doc. No. 290, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 10, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 16, 1897, by Maj. James B. Quinn, Corps of Engineers, of the results of a preliminary examination of Homochitto River, Mississippi, from mouth to the Yazoo and Mississippi Valley Railroad, made to comply with the provisions of the river and harbor act of June 3, 1896.

It is the opinion of Major Quinn that this portion of the Homochitto River is worthy of improvement by the General Government.

In this connection attention is respectfully invited to report, dated December 7, 1892, by Major Quinn, upon a preliminary examination of this river from its mouth to the Louisville, New Orleans and Texas Railroad Bridge, provided for by the river and harbor act approved July 13, 1892. (See Annual Report of the Chief of Engineers for 1893, Part III, pp. 1839–1841.) It was the opinion of the division engineer, concurred in by the Chief of Engineers, that the stream was not then worthy of improvement.

In transmitting the accompanying report to this office the division engineer, Col. J. W. Barlow, Corps of Engineers, stated that no important reasons have been advanced since the submission of the report of December 7, 1892, that would justify the Government in undertaking the improvement of the river.

Inasmuch as the interests involved would appear to justify the clearing out of obstructions, provided the same can be accomplished at a proper cost, it is recommended that such further examination be made and estimate of cost prepared as will permit a full consideration of the relation of cost to interests involved.

Major Quinn reports that the cost of the improvement can be estimated from data at hand.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., January 16, 1897.

GENERAL: I have the honor to submit the following report upon the preliminary examination of the Homochitto River, Mississippi, from mouth to the Yazoo and Mississippi Valley Railroad, in accordance with the instructions contained in letter from your office of June 16, 1896:

I have caused examinations to be made, and have instituted inquiries concerning the subject of the improvement of this river to parties supposed to be interested, and from all I can gather it appears that the

river is capable of improvement, and since it flows through a very fertile country, which would be greatly benefitted, I am of the opinion that the river should be improved.

I made a report on this subject on December 7, 1892, and, although I have waited for some time since the examination was made, I have not been able to obtain any further commercial statistics or other arguments for the improvement of the river than those submitted in the previous report. These statistics are repeated in the report of my assistant engineer, Mr. J. L. Brownlee, which is hereto appended and to which attention is invited.

No further survey is required, since the cost of the improvement can be estimated from the data obtained in making this examination.

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

REPORT OF MR. J. L. BROWNLEE, ASSISTANT ENGINEER.

MAJOR: As directed in your letter of October 23, 1896, I have made a preliminar examination of "Homochitto River, Mississippi, from the mouth to the Yazoo and Mississippi Valley Railroad," and have the honor to submit the following report:

The distance from the railroad to the mouth of the river is about 60 miles, the width of the stream from 150 to 300 feet, and the depth varies from 8 to 20 feet, excepting over the bars, where there are from 2½ to 3 feet.

There is no commerce being carried over this stream, as the obstructions are so numerous as to prevent navigation.

These obstructions consist of bars, formed by sinking rafts, snags, sunken logs, and overhanging trees.

The stream passes through a very fertile country, and if it could be opened to navigation it would furnish a competitive freight route for a vast amount of produce and merchandise, as shown by the commercial statistics attached.

The obstructions could be easily and cheaply removed so as to give a clear navigable channel of fully 6 feet.

The nature of the obstructions is such as to do away with the necessity of a survey. * * *

COMMERCIAL STATISTICS.

This statement is taken from your report of December 7, 1892, of the preliminary examination of Homochitto River, Mississippi, from its mouth to the Louisville, New Orleans and Texas Railroad Bridge, no material change having taken place since that time. They embrace the country on each side of the river for a distance back from the river of 5 miles, and, having been prepared in detail by several gentlemen interested in the improvement, are as nearly accurate as it is possible to obtain them.

Exports:	
37,455 bales cotton, at $30	$840,000
18,000 tons cotton seed, at $7	140,000
Total	980,000
Value of supplies received (collating all the various estimates)	1,436,925
Total probable business	2,416,925

The demand for this improvement arises from the fact that all the tributaries of the Homochitto River enter it at right angles, and the ridges between rise very precipitously to a height of 150 feet, making transportation of crops and supplies to and from either the railroad or the Mississippi River both difficult and expensive.

This stream is eminently worthy of improvement, as it would open an extremely fertile and well-settled country for 180 miles which is now completely destitute of commercial facilities.

Very respectfully, your obedient servant,

J. L. BROWNLEE, *Assistant Engineer.*

Maj. JAMES B. QUINN,
Corps of Engineers, U. S. A.

S 17.

EXAMINATION OF CHANNEL THROUGH ATCHAFALAYA BAY, LOUISIANA, WITH A VIEW TO ASCERTAINING ITS NATURE AND CHARACTER AND OF DETERMINING ITS VALUE AND NECESSITY TO COMMERCE.

[Printed in House Doc. No. 27, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., April 17, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated April 10, 1897, by Maj. James B. Quinn, Corps of Engineers, upon the results of an examination made to comply with the following provision under section 9 of the river and harbor act of June 3, 1896, viz:

The Secretary of War is hereby authorized and directed to ascertain the nature and character of the channel excavated through the Atchafalaya Bay [Louisiana], and to determine whether said channel is of value or of necessity to commerce; and if in his opinion it is, he shall ascertain the cost of acquiring the same for and in behalf of the United States, and report thereon.

This channel, which was created by the Morgan Steamship Company, begins about 3 miles outside the mouth of the Atchafalaya River and extends through the bay to deep water in the Gulf, a distance of about 12½ miles. It has an average width of 100 feet and depth of 7 to 10 feet, one-fifth of the channel having the latter depth.

The principal commerce carried on in this vicinity is by means of such small craft that the channel is not necessary, being seldom, if ever, used except by the Morgan Steamship Company, which uses that portion above the light-house.

Major Quinn states that the channel is of little or no value to navigation, and in the event of the Government desiring to open a channel between the Atchafalaya River and the Gulf, it is doubtful whether it could be used to any advantage. Its owners do not consider the channel of sufficient value to warrant their fixing a price for it.

The division engineer, Col. J. W. Barlow, Corps of Engineers, states that it is apparent from the report of Major Quinn that the acquisition of said channel by the United States is inexpedient and undesirable.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., April 10, 1897.

GENERAL: Pursuant to the instructions contained in letter from your office of November 4, 1896, I have the honor to submit the following report upon the examination of the channel through Atchafalaya Bay, Louisiana:

This examination was made by Mr. J. L. Brownlee, assistant United States engineer, and his report, submitted herewith, is to the effect that the channel is about 12½ miles in length and has an average width of 100 feet and depth of from 7 to 10 feet, one-fifth of the channel having the greater depth.

The principal commerce carried on in this vicinity is by means of such small craft that the channel is not necessary, and seldom, if ever, used. The Morgan Steamship Company, by whom the channel was first created, are the only parties using it at present; in fact, do not use the part below the light-house and points as far out; leave it at the turn and follow the course marked out to the westward, shown in the accompanying Coast Survey chart No. 516.*

I have consulted with the management of the company owning the canal as to the probable cost of same, and I was told that they could hardly place any price upon the channel at present; in fact, owing to the possibility of some other route being chosen in the event of the Government undertaking to open up a deeper channel into the Atchafalaya, they did not think it was worth while to attempt to place a price upon it.

The channel, when dredged, was not revetted in any way, and in consequence it has filled up to such an extent that it is of little or no value to navigation, and in the event of the Government desiring to open up a channel between the Atchafalaya River and the Gulf it is doubtful if it could be used to any advantage, and is therefore considered to be of no value.

Under present conditions the owners do not consider it of sufficient value to warrant the affixing of a price, or, at least, decline to do so under the supposition that it would be of no value to the United States.

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE, SOUTHWEST DIVISION,
St. Louis, Mo., April 12, 1897.

Respectfully forwarded to the Chief of Engineers, United States Army.

From this report it is apparent that the acquisition by the United States of the channel through Atchafalaya Bay, Louisiana, is inexpedient and undesirable.

J. W. BARLOW,
Colonel, Corps of Engineers, Division Engineer.

REPORT OF MR. J. L. BROWNLEE, ASSISTANT ENGINEER.

OFFICE UNITED STATES ENGINEER,
New Orleans, La., April 9, 1897.

MAJOR: I have the honor to submit the following report on the examination of the channel through Atchafalaya Bay, Louisiana:

This channel begins about 3 miles from the mouth of the Atchafalaya River and extends through the bay to deep water in the Gulf, a distance of about 12½ miles. It has an average width of 100 feet and had an original depth of 10 feet.

On sounding the channel it was found to be in good condition as to width, but had shoaled in places to 7 feet at mean low tide. Probably one-fifth of the channel still has a depth of 10 feet, and the balance ranges from 10 to 7 feet.

From the best information I could obtain this channel is used very little, excepting by the Morgan Steamship Company, and this company does not use the entire chan-

*Not printed.

nel, but leaves it at the curve running to red buoy No. 4, where they change to a south-southeast course and continue to deep water.

Accompanying is coast chart No. 516, with new channel indicated in red ink.

Very respectfully, your obedient servant,

J. L. BROWNLEE, *Assistant Engineer.*

Maj. JAMES B. QUINN,
Corps of Engineers, U. S. A.

S 18.

PRELIMINARY EXAMINATION OF BAYOU GROSSETETE, LOUISIANA.

[Printed in House Doc. No. 280, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 8, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated January 16, 1897, by Maj. James B. Quinn, Corps of Engineers, of the results of a preliminary examination of Bayou Grossetete, Louisiana, made to comply with the provisions of the river and harbor act of June 3, 1896.

It is the opinion of Major Quinn that Bayou Grossetete is worthy of improvement by the General Government, and his views are concurred in by the division engineer, Col. J. W. Barlow, Corps of Engineers, who recommends that the snags, stumps, and trees be removed, provided the four bridges obstructing the navigation of the bayou be so modified by their owners as to render them unobstructive. The views and recommendations of these officers are concurred in by me.

No survey is required for the preparation of plan and estimate of cost of improvement.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., January 16, 1897.

GENERAL: In pursuance with instructions contained in letter from your office of June 16, 1896, I have the honor to make the following report upon preliminary examination of Bayou Grossetete, Louisiana:

This bayou seems capable of improvement for a small sum, and since it is well defined and flows through a densely populated and very fertile country it appears to me to be worthy of improvement.

The particulars relative to the stream are fully set forth in the appended report of Mr. P. H. Thomson, assistant engineer, to which attention is respectfully invited.

No further survey is required. The probable cost of improvement can be easily determined from the data obtained in this examination.

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[Third indorsement.]

U. S. ENGINEER OFFICE, SOUTHWEST DIVISION,
St. Louis, Mo., January 28, 189

Respectfully forwarded to the Chief of Engineers, U. S. A., con ring in the views of the district officer, and recommending that project for removing snags, stumps, and trees be approved, provi the obstructing bridges be also properly modified by their owners, s to render them unobstructive to navigation.

J. W. BARLOW,
Colonel, Corps of Engineers, Division Engineer

REPORT OF MR. P. H. THOMSON, ASSISTANT ENGINEER.

PLAQUEMINE, LA., *August 18, 18*

MAJOR: I have the honor to submit the following report of an examinat Bayou Grossetete, Louisiana:

Bayou Grossetete is one of the channels formed from Bayou Fordoche by which the drainage of the parish of Pointe Coupee is carried to Grand River.

In the parish of Pointe Coupee are located the largest levees in the State.

It is a fine stream, from 80 to 100 feet in width at low tide, and has an average d at that stage of 10 feet

The banks are high, reaching in the upper portion an elevation of 20 feet ab low water, and gradually becoming lower until at the junction with Bayou Plaq mine the elevation is 9 feet.

The junction with Bayou Plaquemine is at Indian Village, about 9 miles from t Mississippi River.

The distance from Livonia, on Bayou Fordoche, which is the head of navigati to the junction with Bayou Plaquemine is 30 miles.

OBSTRUCTIONS.

Ascending the stream from the junction to the mouth of Bayou Choctaw, th width is about 400 feet and the depth from 20 to 40 feet.

For a distance of 2½ miles above the Choctaw the bayou is badly obstructed b overhanging timber trees which were placed during the war to prevent the pass of gunboats, logs which were washed in by the Morganza Crevasse, and sand ba which have formed around the obstructions.

During low water the depth over these bars is only a few inches.

At intervals of a few miles trees have been washed into the bayou, and there a many stumps which should be removed. These are especially notable at the Be view and Trinity plantations, just below Rosedale.

Another serious obstacle is found in the bridges, of which there are four acr the bayou, all of which must be entirely rebuilt or removed to open the bayou navigation.

Ascending the stream the first is found about 8 miles below Rosedale. This known as Young's bridge, and is a flimsy trestle, rotten, with no drawspan and opening larger than 16 feet.

The Texas and Pacific Railway crosses the Grossetete at Grossetete Station.

This bridge has a drawspan of 24 feet, but as the line crosses the bayou at angle of 60° the available opening does not exceed 12 feet, and this only for vess not more than 50 feet in length.

Immediately above the bridge are the piles which formed the foundation of former highway bridge, and as the piles have been cut off just above low water th constitute a very serious obstruction, as a rise of a few feet would render the invisible.

At Rosedale the Louisiana Central Railroad (formerly known as the Baton Rou and Grossetete Railroad) crosses upon a trestle which has no opening of any kind fo the passage of vessels, and the bridge has been patched so often as to be a perfe network of piles. At the Barrow plantation, 6 miles above Rosedale, is anoth trestle bridge of the same character as the one at Young's, and it should be entirel removed.

There is a levee on the west bank of the bayou for its entire length, which w intended to guard against the water which might come from crevasses on th Mississippi River front.

When crevasses have occurred in this levee, causing the current to flow directly across the stream, some large trees have been deposited which will have to be removed.

The country on either side of Bayou Grossetete is densely settled; the lands are very fertile and under a high state of cultivation.

The trade of this country was formerly by Bayou Plaquemine, but since the latter stream has been closed it has been at the mercy of the railroads, which charge twice as much as to similar points where water communication exists.

The completion of the lock at Plaquemine would open a communication for all the trade of the bayou.

I consider this stream as eminently worthy of improvement. * * *

No further survey is necessary.

COMMERCIAL STATISTICS.

The navigation of Bayou Grossetete was rendered possible on account of the recent dredging of Bayou Plaquemine. A steamboat with two barges has been making regular trips in the Grossetete for the first time since the building of the dam in Bayou Plaquemine, many years ago.

During the fiscal year ending June 30, 1896, the boat made 76 trips, bringing a total in lumber, cattle, cotton, cotton seed, corn, and wood, of 5,175 tons, valued at $16,150, bringing back from Plaquemine 304 tons of merchandise, valued at $12,160, making a total of $28,310.

Owing to the many obstructions detailed above, the navigation has been difficult and limited. Their removal will result in the employment of other steamers, and lower rates of transportation will prevail.

Respectfully submitted.

P. H. THOMSON, *Assistant Engineer.*

Maj. JAMES B. QUINN,
Corps of Engineers, U. S. A.

S 19.

SURVEY OF BAYOU TECHE FROM ST. MARTINVILLE TO PORT BARRE, LOUISIANA.

[Printed in House Doc. No. 69, Fifty-fifth Congress, first session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., June 11, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated May 7, 1897, with map,* by Maj. James B. Quinn, Corps of Engineers, concerning a survey of Bayou Teche from St. Martinville to Port Barre, La., called for by the provisions of the river and harbor act of June 3, 1896.

The plan of improvement proposed provides for securing a 6-foot navigation between St. Martinville and Port Barre by the construction of two locks in the Teche, one to be located below St. Martinville and the other below the mouth of Bayou Fusileer, and contemplates certain other constructions and dredging. The cost is estimated at $245,086.

In forwarding the report to this office the division engineer, Col. W. Barlow, Corps of Engineers, stated as follows:

The magnitude of the commerce which depends upon the navigation of the Teche for an outlet justifies a reasonable expenditure for the improvement of this stream. I therefore concur in the opinion of the district engineer that, to the extent indicated, the Bayou Teche is worthy of improvement.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. R. A. ALGER,
Secretary of War.

* Not reprinted. Printed in House Doc. No. 69, Fifty-fifth Congress, first session.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., May 7, 1897.

GENERAL: In obedience to the instructions contained in letter fr your office dated November 4, 1896, I have the honor to report as lows concerning the survey of Bayou Teche from St. Martinville Port Barre, La.

This survey was commenced February 5, 1897, and the plotting a office work was finished April 30, 1897. The report of Mr. J. L. Brow lee, United States assistant engineer, who made the survey, is appende hereto.

Several preceding surveys and examinations of this part of Bay Teche had been made, and accordingly the present survey was confin to such investigations as were considered necessary to determine wh if any, changes had occurred.

No noteworthy changes relative to the shoaling of the bayou we observed, and, aside from the growth of bushes and trees obstruct the stream, the conditions were practically the same as were existi at the time of the survey by Mr. H. C. Collins in 1882 and 1883 (Rep of the Chief of Engineers, 1883, page 1113) and of that of Lieut. O. T Crosby, Corps of Engineers, United States Army (Report of Chief Engineers for 1889, page 1518).

The bayou seems to be capable of improvement by means of loc and dams so as to afford slack-water navigation the year round. Du ing high water in the Courtableau it is navigable to Port Barre f boats drawing 6 feet, and it was thought that, possibly, by building lock and dam across the Courtableau below Port Barre, this stage water might be maintained in Bayou Teche, but the low-water discharg of the Courtableau would not be sufficient to maintain the necessar depth without the interposition of locks in the Teche; and, since th water supply of the Teche from other sources seems to be sufficient t supply the required depth without depending upon that furnished b the Courtablean, the construction of the contemplated lock and dam i Courtableau was abandoned, and the project for two locks of 8½ feet lift each in Bayou Teche adhered to.

The location of these locks does not materially differ from that recommended in former reports, i. e., one about 3 miles below St. Martinville and the other just below the mouth of Bayou Fusileer; some dredging in the vicinity of Port Barre; and the construction of a guard lock at Port Barre to prevent the waste into Bayou Courtableau. During high water in the Courtableau this guard gate would remain open and give communication by water transportation between points on the Courtableau and the Teche.

At present the Courtableau is entirely cut off from communication with New Orleans by reason of a raft having formed at its lower end which completely obstructs navigation, and is liable to continue so for some time unless the efforts to remove it, at present under way, prove successful. It is, therefore, a matter of consideration, in the proposed improvement to the Teche, whether the improvement of the Courtableau should not be considered with it; because, if the maintenance of the natural outlet into the Atchafalaya is not feasible, a diversion into the Teche may be necessary. The existence of the necessary locks in the Teche would make the navigation of the Courtableau at all seasons feasible, by the construction of a dam without a lock just

below Port Barre, an arrangement that would greatly benefit the navigation of the Teche at the same time.

By building the locks of concrete and using timber gates, each lock is estimated to cost $74,543. The other constructions, such as guard gate at Port Barre, dams in canal from Spanish Lake, dredging, etc., would bring the total cost of the improvement to secure 6-foot navigation between St. Martinville and Port Barre to $245,086.

The improvement is certainly feasible, and in order to secure the necessary evidence as to the advisability of the improvement, I requested the different parties interested to provide me with some argument in the shape of probable benefits to commerce. I append a letter from Mr. King on this subject, to which attention is respectfully invited. He finds that the commerce directly interested has an annual value of $26,820,479.95, and that the total directly and indirectly interested amounts to $40,820,479.95. It is estimated by him that the improvement would be instrumental in increasing the amount of produce of the country interested from four to ten fold.

I am, therefore, of the opinion that, to the extent indicated, the bayou is worthy of improvement, and that it would be justified by the interests of the commerce involved.

Very respectfully, your obedient servant,

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE, SOUTHWEST DIVISION,
St. Louis, Mo., May 14, 1897.

Respectfully forwarded to the Chief of Engineers, United States Army.

The magnitude of the commerce which depends upon the navigation of the Teche for an outlet justifies a reasonable expenditure for the improvement of this stream. I therefore concur in the opinion of the district engineer that, to the extent indicated, the Bayou Teche is worthy of improvement.

J. W. BARLOW,
Colonel, Corps of Engineers, Division Engineer.

REPORT OF MR. J. L. BROWNLEE, ASSISTANT ENGINEER.

NEW ORLEANS, LA., *April 30, 1897.*

MAJOR: I have the honor to submit the following report on the survey of Bayou Teche, Louisiana, from Port Barre to St. Martinville, La.

The surveying party, consisting of one assistant engineer, one transitman, one recorder, one leadsman, and two boatmen, arrived at Port Barre, La., February 1, 1897. A small house boat having been engaged for quartering the surveying party, all supplies were placed aboard and the work commenced.

General description.—Bayou Teche has its origin at Port Barre, La., being, at high-water season, a run-out bayou from Bayou Courtableau. At the time of the survey there was an average depth of water of 6 feet in Bayou Teche, on account of high water in Bayou Courtableau, but this stage of water only lasts from three to four months at best, and even during that time it is irregular. During the low-water season Bayou Teche is practically dry down as far as Arnaudville. At Arnaudville it receives a supply of water from Bayou Fusileer, but this supply, being limited, does not furnish navigation, so that during the dry season Bayou Teche is not navigable

even for small craft above Breaux Bridge, about 14 miles above St. Martinville, La. At Breaux Bridge the effects of the tide water give a navigable depth of from 3 to 4 feet down to St. Martinville, excepting in case of northers, when the water is driven out.

Bayou Teche flows through one of the most fertile and thickly populated districts of Louisiana. All of the products have to be hauled to and the supplies hauled from the railroad, a distance varying from 6 to 15 miles.

Survey.—A line of levels and a stadia line were run from Port Barre to St. Martinville. All bridges, the public road, and the principal houses were located, and 373 cross sections of the bayou were taken. With a view to the improvement of Bayou Teche, an examination was made of Bayou Fusileer, Bayou Torteau, and Spanish Lake.

The field work of the survey was completed February 13, 1897.

It was found that the distance from St. Martinville to Port Barre was 255,010 feet, or 48.3 miles, and the difference in the elevation of the bottom of the bayou was 17.35 feet, or an average fall of 0.36 of a foot per mile.

The survey was plotted on scale of 400 feet to 1 inch.

Improvement.—After a careful study of the profile of the bayou, together with an examination of the streams furnishing it water during the dry season, it was found that by placing two locks, each with a lift of 8.5 feet, one about 3 miles below St. Martinville and the other below the mouth of Bayou Fusileer, near Arnaudville, together with the necessary dredging and clearing, a navigable depth of 6 feet could be maintained during the entire year up to Port Barre, La.

Locks Nos. 1 and 2.—Lock No. 1 should be located at or near Keystone Plantation, about 3 miles below St. Martinville. This location is chosen on account of the ample water supply to be obtained from Spanish Lake. Spanish Lake is situated about 1¼ miles back from the bayou. It has an area of about 12 square miles, with a depth ranging from 2½ to 16 feet. Mean low water in the lake is 16 feet above mean low water of the bayou. This lake could be lowered without injury to anyone.

The pool formed by Lock No. 1 would be approximately 33 miles long, and its only water supply would during extreme dry seasons come from the overflow and waste from Lock No. 2.

From observations of discharge taken in 1886 by Lieut. O. T. Crosby, Corps of Engineers, U. S. A. (see Chief of Engineers' Report for 1886, Part II, p. 1251), it was found that during the low-water season Bayou Teche, near St. Martinville, gave a daily discharge of 2,790,720 cubic feet of water. This supply comes almost entirely from Bayou Fusileer. Bayou Fusileer drains a large section of country south of Bayou Teche, receiving its supply of water from the numerous swamps and marshes in this region. As this bayou would be the only available water supply for Lock No. 2, the lock should be situated just below the mouth of the bayou.

The pool formed by Lock No. 2 would be about 18 miles long.

Adopting the data used by Lieutenant Crosby as to seepage, leakage, and evaporation, we have the following tables:

Lock No. 2, pool 18 miles long.

	Cubic feet.
Lockage (222 by 50 by 8½) ten times per day	943,500
Leakage	1,132,200
Increased seepage	150,480
Evaporation	15,080
Daily waste	2,241,260
Supply	2,790,720
Daily excess of supply over waste for pool	549,460

Lock No. 1, pool 33 miles long.

Lockage (222 by 50 by 8½) ten times per day	943,500
Leakage	1,132,200
Seepage	41,368,800
Evaporation	43,560
Waste	43,488,060

Supply.

	Cubic feet.	
Lockage from Lock No. 2	943,500	
Leakage from Lock No. 2	1,132,200	
Surplus from Lock No. 2	549,460	
		2,625,160
Daily deficiency		40,862,900

To supply this deficiency Spanish Lake would have to be lowered 0.13 of a foot per day. As the lowering of the lake 1 foot would give 334,540,800 cubic feet of water, it will be seen that even with the liberal estimate for waste it would supply the pool for over thirty days, supposing a drought should cut off all other resources for that time. To secure this supply a canal 50 feet wide and 6 feet deep should be constructed, with flood gates at the lake end to control the supply. The ditch, with necessary slope, would require the removal of 50,000 cubic yards of material.

The pool formed by Lock No. 2 would give a navigable depth to within 5 miles of Port Barre. To extend the 6-foot depth to Port Barre would require the removal of 300,000 cubic yards of material. To give navigation between Bayou Teche and Bayou Courtableau during high-water season, and to prevent the backwater from running from Bayou Teche into Bayou Courtableau, lock gates should be constructed at Port Barre. As they would be used only as guard gates, kept closed during low-water season and kept open during high water, the gates and abutments could be constructed of wood, and the cost would not exceed $5,000.

Estimates.

Locks Nos. 1 and 2. Lock chamber, 222 by 50 feet, with an 8.5-foot lift, built of concrete, pile foundation, wooden gates:		
Material—		
4,400 cubic yards concrete, at $8		$35,200
2,280 piling, 30 feet, for foundation, at $4		9,120
700 linear feet sheet piling, at $3		2,100
4 gates, at $2,000		8,000
16,500 cubic yards excavation—foundation, etc.—at 20 cents		3,300
Flood gates with iron wickets		5,000
Paving slopes, 7,000 square yards		2,100
15 per cent for incidentals, etc., cost of excavating, etc		9,723
Total cost of one lock		74,543
Two locks, at $74,543 each		149,086
Canal and flood gates to control supply of water from Spanish Lake—		
50,000 cubic yards excavation, at 20 cents	$10,000	
Dams with iron wickets	5,000	
		15,000
Clearing and snagging		10,000
Dredging near Port Barre, 300,000 cubic yards, at 12 cents		36,000
Guard gates at Port Barre		5,000
Inspection, etc		30,000
Total		245,086

Maps * of the survey, profile * of the bayou, and cross sections,* showing proposed location of locks, accompany this report.

I was ably assisted on the survey by K. Vedeler, transitman, and B. F. Granger, recorder.

Very respectfully, your obedient servant,

J. L. BROWNLEE, *Assistant Engineer.*

Maj. JAMES B. QUINN,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS CONNECTED WITH THE IMPROVEMENT OF BAYOU TECHE, LOUISIANA.

[Collected by Mr. E. T. King on account of the police juries of the different parishes interested in this improvement.]

LETTER OF MR. E. T. KING.

NEW IBERIA, *February 3, 1896.*

GENTLEMEN: Being appointed by your honorable body to take the statistics of the commerce of the parish of Iberia, State of Louisiana, I beg leave to inform you that I have completed the work you appointed me to do, and submit to you my tabulated report, giving the names and amount shipped by each, also a tabulated report of what has been received as an estimate of the balance of our imports. You will see, by an examination of the report, that we have received or imported more than we have shipped. This may look bad, but if you will look around and see the improvements going on in the towns, villages, and all over the parish—costly central sugar

* Not printed.

factories being put up and all the others being improved by putting up new and expensive machinery for the manufacture of sugar, the new, and some of them costly, buildings going up in our towns, the land being fenced up and put in cultivation — you will not find it strange. It either proves that foreign capital is being invested or that the banks and commission merchants are helping our people develop the rich resources of our country.

These statistics make a very fair showing—more than double what they were ten years ago, although it is well known last year was a bad one for sugar cane. Owing to the drought during July, August, and September, when the sugar cane makes its principal growth, it was cut short at least one-third. With proper encouragement by the National Government and the improvement of the navigation of the Bayou Teche, the opening and locking the Bayou Plaquemine and improvement of the navigation connected therewith, the protection of our people from the floods of the Mississippi River, either through the Atchafalaya River or breaks in the levees, our people can and will, within a few years, produce four times as much sugar as they did last year, and in course of time ten times as much, for our resources are nothing like developed. Surely this showing, with the three other parishes of the Teche, will be ample justification for the small appropriation asked.

I wish you to give this report a careful examination, and if you find any mistakes or want any corrections made call my attention to them and I will cheerfully correct them. It has been my intention to make them as correct as possible, and wish you to certify to the same.

Respectfully,

E. T. KING.

POLICE JURY,
Parish of Iberia, La.

Exports.

17 sugar factories, 38,837,120 pounds sugar, at 3¼ cents	$1,132,206.40
17 sugar factories, 6,874,500 barrels molasses, at $8	549,960.00
8 rice factories, 7,326 sacks, at $3	21,978.00
10 cotton gins, 7,095 bales, at $38.50	273,157.50
10 cotton seed, 4,100 tons, at $6	24,600.00
4 sawmills, 25,100,125 feet, at $11	276,101.75
5 shingle mills, 81,500,000 M, at $1.50	122,250.00
Sugar cane shipped, 26,665 tons, at $3	79,959.00
Merchants shipped eggs, 203,405 dozen, at 10 cents	20,340.50
Merchants shipped poultry, 1,545 dozen, at $3	4,635.00
4 brick yards, 6,227,000 brick, at $6	19,662.00
1 salt mine, 602,125 sacks, at 65 cents	391,381.25
1 merchant and others, 7,401 hides, at $1	7,401.00
2 foundries and workshops, value	45,775.00
2 ice and bottling factories, value	5,550.00
1 cotton-seed oil mill, value	46,100.00
Escertents moss, etc., value	26,260.00
Total exports	3,247,363.40

Imports.

[Partly consolidated and estimated.]

Factories, mills, steamboats, etc	$142,490.00
Machinery, tools, and implements	402,210.00
Lumber in logs, 43,120,000 feet, at $6	258,720.00
Mules and horses, 1,956, at $125	244,500.00
Dry goods, furniture, drugs, and medicine	841,265.40
Groceries, liquors, hardware, and farm implements	1,583,930.95
Total commerce	6,720,479.95
Total commerce for St. Mary Parish	12,100,000.00
St. Martin Parish, total commerce	4,500,000.00
St. Landry Parish, Bayous Teche and Courtableau	3,500,000.00
Total commerce directly interested	26,820,479.95
Indirectly interested:	
Vermilion Parish, total commerce	5,000,000.00
Lafayette Parish, total commerce	4,500,000.00
St. Landry Parish	4,500,000.00
Grand total	40,820,479.95

S 20.

SURVEY OF SABINE LAKE, TEXAS, WITH A VIEW OF OBTAINING THROUGH SAID LAKE A SHIP CHANNEL OF SUFFICIENT WIDTH AND DEPTH FOR THE PURPOSE OF NAVIGATION FROM SABINE PASS TO THE MOUTHS OF THE NECHES AND SABINE RIVERS.

[Printed in House Doc. No. 299, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 11, 1897.

SIR: I have the honor to submit the accompanying copy of report, dated February 3, 1897, by Maj. James B. Quinn, Corps of Engineers, of the results of a survey of Sabine Lake, Texas, with a view of obtaining through said lake a ship channel of sufficient width and depth for the purpose of navigation from Sabine Pass to the mouths of the Neches and Sabine rivers, made to comply with the provisions of the river and harbor act of June 3, 1896.

It is estimated that a channel 25 feet deep with bottom width of 100 feet through the lake would cost $4,117,800. To obtain a channel of similar width having a depth of 12 feet would cost $2,900,000. The work of securing either of these channel dimensions involves dredging and construction of guard locks and revetments. An 8-foot channel depth with bottom width of 150 feet, requiring dredging and revetment construction, would cost $550,000, and could be maintained by an expenditure of $20,000 per year. An estimate of $20,000 is also submitted as the cost of securing a channel 6 feet deep.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., February 3, 1897.

GENERAL: In obedience to instructions contained in letter from your office under date of November 4, 1896, authorizing survey of "Sabine Lake, Texas, with a view of obtaining through said lake a ship channel of sufficient width and depth for the purpose of navigation from Sabine Pass to the mouth of the Neches and Sabine rivers," I have the honor to report that the survey was completed January 28, 1897.

The survey party was under the command of Mr. J. L. Brownlee, United States assistant engineer, and consisted of 2 transitmen, 1 recorder, 1 pilot of launch, 1 leadsman, and 4 boatmen.

The survey was commenced November 24, 1896, and the field work completed January 23, 1897.

LOCATION AND DESCRIPTION OF SABINE LAKE.

Sabine Lake is situated at the head of Sabine Pass, about 7 miles from the Gulf of Mexico. The Sabine and Neches rivers flow into the north end of the lake, but it is, strictly speaking, a tidal lake. It is about 16 miles long and varies in width from 4½ miles at the south end to 7 miles at the north end, and has an area of about 100 square miles.

The land along the shore on the Texas side, from Sabine Pass to the mouth of the Neches River, is a low prairie and in some places marshy. Its general elevation along the lake shore varies from 2 to 4 feet above mean low water of the Gulf, excepting a narrow ridge, which has an elevation as high as 6.4 feet above mean low water. Between the Neches and the Sabine rivers the land is low and marshy. From Sabine River to Johnsons Bayou, on the Louisiana side of the lake, the land is low, but some good farming land. Johnsons Bayou is the water outlet—in fact, the only outlet—for the produce of a rather thickly settled and fertile country. It has a least depth of 12 feet, but over the bar at the mouth there is but 2½ feet. An expenditure of $2,500 would give a depth of 6 feet into the bayou. From Johnsons Bayou to Sabine Pass it is a low and marshy country and is used only for grazing.

TRIANGULATION.

To cover this large area seven triangulation stations were built. A base line 33,370 feet long was measured between two of these stations. Four sets of angles were read and adjusted.

LEVELS.

A line of levels was run from the Government bench mark at Sabine Pass to the mouth of the Neches River, a distance of about 20 miles. and tide gauges established and read at the head of the pass, at Port Arthur (about half way up the lake), and at the mouth of the Neches River.

SOUNDINGS.

The lines of soundings located aggregated about 166 miles. They were located by two angles read on shore and are reduced to mean low water. The soundings were taken with a sounding pole, from the naphtha launch, the launch running at a speed of about 5 miles an hour. The system of signaling was the same as used on the surveys at Sabine Pass.

The shore line, of which there was about 53 miles, was located in same manner as soundings.

It was found that the water in the lake varied in depth from 5 to 8 feet, the shoalest water being on Blue Buck Bar. In 1895 the Sabine River Bar was dredged out by the Government dredge, and it was found that this cut was still in good condition. The Government dredge also started on a cut across the Neches Bar, but funds were exhausted before the cut was completed. There is now a depth of 5 feet over this bar.

ESTIMATES.

Cost of a 25-foot channel, with a bottom width of 150 feet, from deep water in Sabine Pass to the Neches and Sabine rivers.—To secure any degree of permanence to such a channel it would require the construction of a substantial revetment on each side of the channel, and as the revetment will be the most expensive part of the work, the channel should follow close to the west shore, say, in about 2 feet of water, thus reducing the cost of the revetment. The revetment on the east side of the channel would be to protect it against the wash caused by the severe storms that sweep over the lake. It should be very substantial, and would cost about $20 per linear foot. The revetment on the west side of the channel would protect it from the slight wash

on that side, and at the same time retain the material dredged. As the material could then be thrown over this revetment, it would reduce the cost of dredging, otherwise the problem of a dumping ground would greatly increase the cost of dredging. This could be a light revetment, and would cost about $10 per linear foot.

To dredge this channel with a bottom width of 150 feet and a slope of 1 on 1½ from the 25-foot contour in Sabine Pass to deep water in the Neches and Sabine rivers would require the removal of about 18,000,000 cubic yards of material. This material is soft mud down to about 16 feet below mean low water; from that down is a hard clay, which would be difficult to dredge. It is thought that 12.5 cents per cubic yard would be a fair average price for an estimate.

114,000 linear feet of heavy revetment, at $20 per foot	$2,280,000
114,000 linear feet of light revetment, at $10 per foot	1,140,000
18,000,000 cubic yards of excavation, at 12.5 cents per cubic yard	2,250,000
10 per cent for contingencies, etc	567,000
Total cost	6,237,000

In considering an estimate for a 25-foot channel it might be well to here call attention to the Neches and Sabine rivers. To benefit the commerce tributary to Sabine Lake with a channel of that depth, it would have to be carried up to Beaumont, on the Neches River (a distance by water of about 30 miles), and on to Orange, on the Sabine River (a distance by water of about 12 miles). From a personal knowledge of these rivers it is known that it would require a considerable expenditure to make them navigable to the class of vessels using a 25-foot channel, but the amount required could only be estimated from a survey.

A 12-foot channel with a bottom width of 150 feet and a slope of one on one and one-half, from the 12-foot contour in Sabine Pass to deep water in the Neches and Sabine rivers.—This channel should follow the same line suggested for the 25-foot channel and have the same protection, as from past experience it could not be maintained without thorough protection. It would require the removal of about 6,600,000 cubic yards of material, and as this would be soft mud, 10 cents per cubic yard is considered a safe price for an estimate.

108,000 linear feet of heavy revetment, at $20 per foot	$2,160,000
108,000 linear feet of light revetment, at $10 per foot	1,080,000
6,600,000 cubic yards of excavation, at 10 cents per cubic yard	660,000
10 per cent for contingencies, etc	390,000
Total cost	4,290,000

An 8-foot channel with a bottom width of 150 feet and a slope of one on one and one-half, from the 8-foot contour in Sabine Pass to deep water in the Neches and Sabine rivers.—This channel should run direct from the head of the pass to the Neches River, thence to the Sabine River. It would, of course, fill up, but could be maintained with a reasonable expenditure annually. It would have no revetment, and would require the removal of about 1,500,000 cubic yards of material. At 10 cents per cubic yard it would cost about $150,000.

There is also submitted an estimate for a 6-foot channel. As a channel of that depth could be secured at a reasonable cost, it could be cheaply maintained, and at the same time would afford barge navigation for lumber from the mills to Sabine Pass. This channel would require the removal of about 200,000 cubic yards of material, and, at 10 cents per cubic yard, would cost about $20,000.

Before summarizing these estimates it is to be observed that the channel of greatest depth would cost a sum beyond what is believed to be reasonable for any object that has been presented as an argument for its construction, even though the channel was reduced to 100 feet in width and the light revetment omitted, reducing the cost to $3,817,800, but I do not believe that it would be possible to maintain this channel upon the shortest lines indicated. It is necessary to give access to both rivers, and to do this it would have to cross the Neches, and it would inevitably fill up at this point, and in addition there is the very obvious likelihood of the Neches River being diverted into the channel and pouring all its silt directly into the deep water of Sabine Pass, to the manifest injury of the harbor.

To avoid this a guard lock would have to be built and maintained at the point where the channel would debouch in the Neches River, and this would cost not less than $100,000.

The permanence of the entrance to Sabine Harbor depends greatly upon the fact that both the Sabine and Neches rivers flow into Sabine Lake, and before this water reaches the head of Sabine Pass it is deprived of the greater part of the sedimentary material in suspension, the lake serving as an immense settling reservoir.

This condition should not be disturbed, and hence the necessity for a guard lock at the head of this cut where it enters the Neches.

Between the Neches and Sabine rivers a canal would have to be dug, and probably guard locks placed at either end, since the stages of these two rivers could not be depended upon to be always alike. It would be difficult to maintain such a connecting canal without some such arrangement to limit the deposit of silt within it, and this arrangement would probably add another $200,000 to the lowest estimate, making the total $4,117,800, too large a sum to be considered with favor.

The 12 foot channel would be open to the same objections which apply to the 25-foot channel.

If the channel is reduced to 100 feet width and the light revetment omitted, this would cost, including the guard locks, $2,900,000, a sum far in excess of that which the advantage of this depth to navigation would warrant according to present circumstances.

The 8-foot channel appears to give more promise of success than any of the others. It can be dredged out for $150,000 and maintained with reasonable promise of success for $20,000 per year. It is possible that for a short distance in the lake some revetment may be necessary, particularly at the lower end. This revetment would cost $400,000, but since it would contribute greatly to the permanence of the channel this additional expenditure is belived to be essential. The total cost of this channel would, under these conditions, amount to $550,000, a sum that is certainly within the bounds of reasonable expenditure, and which is believed to be not excessive for the commercial interests involved. * * *

SUMMARY OF REVISED ESTIMATES.

Channel 25 feet deep, with bottom width of 100 feet	$4,117,800
Channel 12 feet deep, with bottom width of 100 feet	2,900,000
Channel 8 feet deep, with bottom width of 150 feet	550,000
Channel 6 feet deep (not recommended)	20,000

Very respectfully, your obedient servant,

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

APPENDIX T.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN TEXAS.

REPORT OF MAJ. A. M. MILLER, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1897, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Galveston Harbor, Texas.
2. Ship channel in Galveston Bay, Texas.
3. Channel in West Galveston Bay, Texas.
4. Trinity River, Texas.
5. Buffalo Bayou, Texas.
6. Brazos River, Texas.
7. Operating and care of Morgans Canal, Texas.

EXAMINATION.

8. Channel between Brazos River and Galveston Bay, Texas.

SURVEY.

9. Galveston Island, Texas.
10. Improvements at mouth of Brazos River, Texas.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., July 14, 1897.

GENERAL: I have the honor to forward herewith annual reports for the works of river and harbor improvements in my charge for the fiscal year ending June 30, 1897.

Very respectfully, your obedient servant,

A. M. MILLER,
Major, Corps of Engineers.

Brig. Gen. JOHN M. WILSON,
Chief of Engineers, U. S. A.

T 1.

IMPROVEMENT OF GALVESTON HARBOR, TEXAS.

This work is being carried on under a project formulated by a Board of Engineers January 21, 1886, the report on which may be found in the Annual Report of the Chief of Engineers for 1886, page 1294 et seq.

At the close of the last fiscal year the construction of jetties, under the contract of O'Connor, Laing & Smoot, and dredging with the U. S. dredge *Gen. O. B. Comstock*, were in progress.

At that time the south jetty had been completed for a length of 33,100 feet and partially completed for a length of 1,920 feet, and the north jetty had been completed for a length of 23,300 feet and partially completed for a length of 1,810 feet.

These jetties are built of riprap, covered with granite blocks, and are carried to an elevation of 5 feet above mean low tide. The general method of constructing the jetties is described on page 1530, Annual Report of the Chief of Engineers for 1892, and page 1392, Annual Report of the Chief of Engineers for 1894. The abstract of proposals, giving prices paid for the different parts of the work, will be found on pages 1878 and 1879, Annual Report of the Chief of Engineers for 1891.

During the present fiscal year the construction of both jetties by contract was continued, and the *Comstock* was kept at work dredging along the line of the channel.

SOUTH JETTY.

The construction of this jetty was continued until February 14, 1897, when work was suspended, the jetty having been completed according to the original designs of this office. It was extended during the fiscal year 1,700 feet, its length being 34,800 feet, with an apron 803 feet long at its outer extremity to protect it. Under date of April 14, 1897, the Department decided that the length of apron to protect completed jetty should be 300 feet. This decision will necessitate the building up 500 feet of this jetty to its full height—5 feet above mean low tide.

NORTH JETTY.

The advance during the year in the completed work on this jetty amounted to 1,400 feet, its length on June 30, 1897, being 24,700 feet; in addition, it was partially completed for a length of 1,207 feet. It was expected that this jetty would be finished when the completed portion was 25,100 feet long, with an apron 807 feet long at its outer extremity to protect it. The completed portion, under the decision of the Department on April 14, 1897, will have to be 25,700 feet long, the length of apron being diminished to 307 feet.

A detailed account of the work done, the cost, and the amount of subsidence in the jetties, will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, and to which attention is invited.

DREDGING.

During the year the U. S. dredge *Gen. C. B. Comstock* worked seven months with a double crew, three and one-third months with a single crew, and was laid up one and two-thirds months for extraordinary repairs.

A description of the dredge *Comstock* will be found on pages 1530–1531, Annual Report of the Chief of Engineers for 1896.

Dredging was principally confined to the channel between the jetties, which was deepened, widened, and straightened. A small amount of dredging was also done on the inner bar at the entrance to the Galveston Channel.

The total amount of material removed during the year was 806,646 cubic yards, of which 255,675 cubic yards was sand taken from the outer bar, 529,190 cubic yards mud and clay from inside the bar, and

21,781 cubic yards from the inner bar. The average cost per cubic yard dredged was 5.34 cents for operating expenses and 1.85 cents for extraordinary repairs, making the total cost for the year 7.19 cents, which was 0.21 cents less per cubic yard than last year.

Below are given further details of the dredging in tabulated form:

Résumé of work done by U. S. dredge Gen. C. B. Comstock during the fiscal year ending June 30, 1897.

	Time.	
	h.	m.
Effective working time	3,380	47
Delays for bad weather	577	59
Delays for repairs	772	50
Delays for other causes	1,121	14
Idle on account of Sundays and holidays	1,056	00
Total time made	6,908	50

Distribution of working time.

	Time.		Per cent.
	h.	m.	
Anchorage to cut	142	53	4
Pumping	2,272	40	66
Cut to dump	328	34	9
Dumping	142	05	5
Dump to cut	288	35	9
Dump to anchorage	146	38	5
Time lost turning	59	22	2
Total	3,380	47	100

Number of loads dredged		1,464
Average output per hour of digging	cubic yards	355
Average amount dredged per minute in sand	do	5.19
Average amount dredged per minute in mixed mud and sand	do	5.44
Average amount dredged per minute in mixed material	do	6.79
Average amount dredged per minute in sticky mud (inner bar)	do	4.90

Cost of dredging.

	Total amount expended.	Cost per cubic yard.
Wages	$19,328.09	$0.0239
Subsistence	5,425.92	.0067
Fuel	10,083.74	.0125
Oils, waste, etc	2,208.28	.0027
Miscellaneous supplies and new outfit	1,075.80	.0013
Ordinary maintenance	4,216.22	.0052
Contingent expenses	890.26	.0011
Operating cost	43,218.31	.0534
Extraordinary repairs	14,924.71	.0185
Total	58,143.02	.0719

TIDAL OBSERVATIONS.

These observations were continued throughout the year, three automatic tide gauges having been in operation.

STORMS.

But one storm of any consequence occurred during the fiscal year, which was on March 28, 1897. The tracks and trestles of both jetties were considerably damaged, large sections having been carried away. But for this storm the jetties would have been almost completed at the end of the year. Besides washing away the trestle the storm effected a general subsidence and consolidation of the sandstone, especially at the outer ends, on account of the more exposed situation.

SURVEYS.

Monthly surveys of the outer bar and occasional surveys of the inner bar were made as weather permitted.

These surveys show the following least depths on the outer bar at mean low tide:

	Feet.		Feet.
July, 1896	23¼	January, 1897	25
August, 1896	24¼	February, 1897	25
September, 1896	24¼	April, 1897	25¼
November, 1896	24¼	May, 1897	25¼
December, 1896	25	June, 1897	25¼

In August, 1896, the inner and outer 24-foot curves met, and have remained open ever since, the navigable depth varying from 24 to 25¼ feet.

The usual annual survey of the harbor and vicinity was made, a map of which is forwarded herewith. This map also has on it the contours of 1893, thus showing the changes that have occurred since the north jetty was started.

The report of Mr. E. M. Hartrick, assistant engineer, gives detailed description of the changes that have occurred in the various contours.

The gain in depth on the outer bar during the year was 2¾ feet.

The deepest loaded vessel to cross the bar, up to the present time, was the *Belgian King*, which cleared on May 16, 1897, drawing 24 feet 7 inches.

Amount expended on this improvement to June 30, 1896	$6,910,103.42
Amount expended during the fiscal year	991,261.47
Total amount expended to June 30, 1897	7,901,364.89

Money statement.

July 1, 1896, balance unexpended		$1,068,196.58
Amount appropriated by sundry civil act approved June 4, 1897		500,000.00
		1,568,196.58
June 30, 1897, amount expended during fiscal year		991,261.47
July 1, 1897, balance unexpended		576,935.11
July 1, 1897, outstanding liabilities	$114,747.02	
July 1, 1897, amount covered by uncompleted contracts	291,090.87	
		405,837.89
July 1, 1897, balance available		171,097.22

Abstract of appropriations made by Congress for improving harbor at Galveston, Tex.

By act of—		By act of—	
July 11, 1870	$25,000	August 11, 1888	$500,000
March 3, 1871	20,000	September 19, 1890	500,000
June 10, 1872	31,000	March 3, 1891	600,000
June 23, 1874	60,000	August 5, 1892	450,000
March 3, 1875	150,000	March 3, 1893	1,000,000
August 14, 1876	142,000	August 18, 1894	600,000
June 7, 1878	75,000	January 25, 1895	200,000
June 18, 1878	50,000	March 2, 1895	1,160,000
March 3, 1879	100,000	February 26, 1896	300,000
June 14, 1880	175,000	June 3, 1896	50,000
March 3, 1881	250,000	June 11, 1896	840,000
March 4, 1882	100,000	June 4, 1897	500,000
August 2, 1882	300,000		
August 5, 1886	300,000	Total	8,478,000

In addition to the above appropriations by Congress, there has been collected from steamship *Maritime* 300

Total 8,478,300

Contract in force for improving harbor at Galveston, Tex.

Contract dated May 12, 1891, with John F. O'Connor, Joseph Laing, and Edgar K. Smoot, doing business under the firm name of O'Connor, Laing & Smoot, for constructing jetties at entrance to Galveston Harbor, contract having been approved June 2, 1891. Work began August 1, 1891; no time set for completion, this being a continuous contract.

COMMERCIAL STATISTICS OF GALVESTON HARBOR, TEXAS, FOR FISCAL YEAR ENDING JUNE 30, 1897.

Tonnage of vessels and revenue collected.

Entered and cleared.	Steam vessels.	Sailing vessels.	Total.	Total tonnage.
Entered	451	82	533	802,057
Cleared	448	68	516	806,192
Total	899	150	1,049	1,608,249

Duties on imports collected $114,243.65

Amount and value of freight transported.

Articles.	Tons.	Approximate value.
Cotton (1,346,226 bales)	378,335	$55,845,827
Cotton products	162,790	8,572,088
Ore	12,473	1,281,515
Wool	5,428	650,790
Grain	272,340	4,130,483
Sugar	1,133	79,349
Coal	142,092	349,835
General merchandise	235,216	2,352,166
Total	1,209,822	68,261,553

Increase of freight carried compared with last year ..... tons.. 437,226

Comparative statement for fiscal years 1895 to 1897.

Articles.		1895.	1896.	1897.
Cotton	tons	402,385	249,227	[illegible]
Cotton products	do	125,172	112,350	[illegible]
Ore	do	1,000	1,514	[illegible]
Wool	do	7,337	6,031	[illegible]
Grain	do	1,317	127,602	[illegible]
Sugar	do	.....	3,207	[illegible]
Coal	do	288,914	141,230	[illegible]
General merchandise	do	.....	131,435	[illegible]
Total tonnage		826,125	772,596	[illegible]
Total value		$56,951,000	$46,490,800	[illegible]

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., July 6, 1897.

SIR: I have the honor to submit the following report of operations for improving Galveston Harbor during the fiscal year ending June 30, 1897:

SOUTH JETTY.

At the beginning of the fiscal year south jetty was complete to Station 331, riprap mound was to mean low tide at Station 337, and trestle at Station 350. Work was suspended on this jetty February 14, 1897, leaving the jetty complete to Station 348, an advance of 1,700 feet; riprap mound to mean low tide at Station 348; apron at Station 356+03.

On July 23, 28, and 31, 1896, collapse of trestle and wreck to cars, on account of the contractors neglecting to keep the trestle and track in good repair, caused the work to be suspended until September 10, 1896, when unloading riprap recommenced, but to be again suspended between the 22d and 29th on account of damage to trestle by storm. In November and December, 1896, boisterous weather, accompanied with rough seas, caused considerable damage, and again on January 2 and 3, 1897, a storm stopped the delivery of stone at the front.

On February 14 work was suspended for the present. The trestle and track is in bad condition, so much so that it may have to be completely renewed before recommencing operations, as it is rapidly deteriorating from heavy seas, weather, and Teredo navalis.

TABLE NO. 1.—*Showing kind and amount of stone placed in south jetty.*

Month.	Cars.	Riprap.	Cars.	Block.	Total cars.
1896.		*Tons.*		*Tons.*	
July	286	5,965.12	284	6,802.21	[illegible]
September	522	11,044.16	103	2,577.40	[illegible]
October	466	10,140.26	144	3,531.86	[illegible]
November	175	4,012.63	331	8,037.78	[illegible]
December	309	7,025.64	678	16,973.14	[illegible]
1897.					
January	160	3,616.65	412	10,629.28	[illegible]
February	46	992.60	182	4,687.38	[illegible]
Total	1,964	42,797.06	2,134	53,239.05	[illegible]

August was occupied in repairing trestle. Work suspended February 14, 1897.

TABLE NO. 2.—*Showing average cost per linear foot between stations.*

[Cost does not include office and inspection expenses.]

Station.	Distance.	Average depth of water.	Cost per linear foot.	Remarks.
	Feet.	*Feet.*		
0 to 79+64	7,964	.....	$19.52	Shore connection across old channel; average height 1.07 feet above mean low tide.
79+64 to 84+64	500	8	34.36	Shore branch.
84+64 to 95+64	1,100	2.45	28.59	
95+64 to 107+64	1,200	1.50	36.57	Clay core.
107+64 to 138+64	3,100	5.70	72.41	Do.
138+64 to 144+12	548	9.50	73.58	Do.
144+12 to 150	588	7.50	60.58	
150 to 160	1,000	7.80	56.69	
160 to 170	1,000	8.65	55.73	
170 to 180	1,000	7	40.58	
180 to 190	1,000	7.50	43.83	
190 to 200	1,000	10.95	79.89	Granite protection from station 194.
200 to 210	1,000	10.85	81.40	
210 to 220	1,000	9.69	76.20	
220 to 230	1,000	7	72.75	
230 to 240	1,000	8.70	76.86	
240 to 250	1,000	9	80.70	
250 to 260	1,000	9.80	82.99	
260 to 270	1,000	10.20	89.96	
270 to 280	1,000	9.10	80.20	
280 to 290	1,000	9.20	74.29	
290 to 300	1,000	9.10	78.55	
300 to 310	1,000	10.10	78.98	End of mattress work.
310 to 320	1,000	16.50	137.26	Sand foundation.
320 to 330	1,000	23	a 198.58	Old apron 320–328+39.
330 to 340	1,000	23.50	272.65	
340 to 350	1,000	22.90	243.07	Granite complete to station 348.
350 to 356+03	603	24.50	26.58	Apron from stations 348–356. Riprap only.

a Due to scour alongside at the toe and ahead of the apron between June, 1893, and August, 1895.

NORTH JETTY.

At the beginning of the fiscal year north jetty was complete to Station 233; riprap mound to mean low tide at Station 234; apron and trestle to Station 251+10. Jetty completed July 3 to Station 250, an advance of 1,700 feet; riprap mound to mean low tide at Station 250; apron to Station 259+07, the end of jetty for the present.

No work was done during the month of January, nor until the 15th of February, 1897, on account of repairs necessary to trestle and track caused by the storm of January 2 and 3, 1897. On March 28 a storm from the southeast caused damage to 6,200 feet of trestle, from Station 197 to 259. This practically stopped the work until the 15th of April, 1897, when unloading riprap from barges commenced, which is a very slow and tedious process in comparison with the previous method. The repairs to trestle and track are completed to Station 220+60, leaving about 3,500 feet to be repaired before riprap can be unloaded from trestle.

HANDLING RIPRAP FROM BARGES—TEMPORARY METHOD.

The cars are culled and weighed at Fort Point in the usual manner. They are then run, accompanied by a track derrick, onto the transfer barge. The track derrick handles a "rock boat" or "skip," in which the small riprap has been placed by hand, and dumps its contents on the deck of a stone barge lying alongside of the transfer barge. The larger riprap is handled with slings, one block at a time. The stone barge, which holds from 18 to 25 cars, is then towed out to the work and the stone unloaded onto the jetty in a similar manner by a floating derrick. By this method from 8 to 11 cars is considered a good day's work. Fifteen cars in thirteen hours has been the best day's work to date. Sixty cars a day from the trestle was considered an ordinary day's work. If the contractors had to depend entirely upon barges for the supply of riprap, a different method could be employed that would facilitate loading and unloading.

TABLE NO. 3.—*Showing kind and amount of stone placed in north jetty.*

Month.	Cars.	Riprap.	Cars.	Block.	Total cars.
1896.		*Tons.*		*Tons.*	
July	906	20,856.46	340	8,573.86	1,27[illegible]
August	440	9,407.01	457	11,233.75	[illegible]
September	202	4,854.74	307	7,701.83	[illegible]
October	625	13,653.63	442	11,120.73	1,06[illegible]
November	566	13,215.08	.....	.....	[illegible]
December	502	11,429.48	.....	.....	[illegible]
1897.					
February	140	3,429.19	38	1,005.62	[illegible]
March	484	10,861.15	496	12,790.83	[illegible]
April	61	1,348.09	88	2,243.64	[illegible]
May	136	2,980.87	100	2,499.04	[illegible]
June	147	3,191.68	145	3,770.22	[illegible]
Total	4,239	94,177.38	2,413	60,939.08	6,65[illegible]

January was occupied in repairing trestle.

TABLE NO. 4.—*Showing average cost per linear foot between stations.*

[Cost does not include office and inspection expenses.]

Stations.	Distance.	Depth of water.		Cost per linear foot.	Remarks.
		Maximum.	Minimum.		
	Feet.	*Feet.*	*Feet.*		
0 to 15	1,500	.....	.....	$15.56	Shore branch.
15 to 20	500	8	0.5	35.73	Granite on crest; none on slope.
20 to 30	1,000	11	7.5	67.69	Granite on crest and slope from Station 24.
30 to 40	1,000	11.5	9	69.64	
40 to 50	1,000	11.5	9.5	71.34	
50 to 60	1,000	11.5	6.5	66.67	Quicksand reef.
60 to 70	1,000	8	5	70.09	Do.
70 to 80	1,000	9	6.5	76.54	Do.
80 to 90	1,000	12.5	9	101.03	
90 to 100	1,000	15	11	113.40	
100 to 110	1,000	19	15	124.92	
110 to 120	1,000	18	16.25	126.97	
120 to 130	1,000	21	17.25	138.95	
130 to 140	1,000	19	16	129.35	
140 to 150	1,000	16.5	16	135.90	
150 to 160	1,000	16.5	15	123.05	
160 to 170	1,000	16.4	16.1	126.06	
170 to 180	1,000	19	16	158.02	
180 to 190	1,000	17	15.5	148.96	
190 to 200	1,000	19	11.5	154.82	Outer bar.
200 to 210	1,000	13.5	7.5	151.57	
210 to 220	1,000	18	8.5	160.83	As the work progressed there was thrown up a small ridge of sand. The original depth over the bar on the axis of this jetty was 11 feet.
220 to 230	1,000	22.5	21.5	a 282.21	
230 to 240	1,000	24.5	21.5	265.33	
240 to 250	1,000	28	24.5	356.98	
250 to 259+07	907	30	28	84.57	

a The riprap mound, before it had been protected on its slope, was washed down and flattened, requiring more riprap to build it up and more granite to cover it.

CONDITION OF JETTIES.

The condition of both jetties remains the same as last year, excepting a general subsidence and consolidation, which is more marked at the outer ends.

Storms, although not remarkable for violence, have caused more damage to trestle and track than in any previous year of the present contract. This is owing to the more exposed situation of the work after passing the outer bar toward deep water in the Gulf of Mexico.

The table following shows the average amount of subsidence in each 1,000 feet of jetty.

TABLE NO. 5.—*Subsidence of south jetty.*

[Elevations show the height above mean low tide.]

Stations.	Date.	Elevations.		Total subsidence to May, 1896.	Remarks.
		July, 1890, to Feb., 1897.	May, 1896.		
		Feet.	*Feet.*	*Feet.*	
0 to 10	July, 1890	5.98	5.80	.16	Levels in July, 1890, were taken from Stations 0 to 180, including shore, branch, and clay core which have been brought up from time to time to crest level. Between Stations 0 and 130 stones were removed during 1895, the contractors repairing their track; also 20 cars of stone were unloaded between Stations 121 and 131. The old brush mattress extends from Stations 84 + 64 to 310, over which the stone jetty is built.
10 to 20	do	6.23	5.53	.70	
20 to 30	do	6.32	6.02	.30	
30 to 40	do	6.42	5.98	.44	
40 to 50	do	6.43	6.25	.18	
50 to 60	do	6.42	6.13	.29	
60 to 70	do	.....	5.83	.....	
70 to 80	do	6.29	5.60	.69	
80 to 90	do	5.74	5.19	.55	
90 to 100	do	5.90	5.57	.33	
100 to 110	do	5.93	5.65	.28	
110 to 120	do	6.27	5.31	.96	
120 to 130	do	6.51	6.14	.37	
130 to 140	do	6.40	5.96	.44	
140 to 150	do	5.56	5.27	.29	
150 to 160	do	5.53	5.27	.26	
160 to 170	do	5.53	5.17	.36	
170 to 180	do	6.02	5.75	.27	
180 to 190	Jan., 1891	6.17	5.60	.57	
190 to 200	Nov., 1893	5.01	4.66	.35	
200 to 210	Apr., 1895	4.86	4.83	.03	
210 to 220	do	5.05	5.04	.01	
220 to 230	do	4.53	4.45	.08	
230 to 240	do	4.77	4.66	.11	
240 to 250	do	4.49	4.41	.08	
250 to 260	do	4.74	4.70	.04	
260 to 270	do	5.09	4.95	.14	
270 to 280	do	4.98	4.90	.08	
280 to 290	do	5.61	5.45	.16	
290 to 300	do	5.84	5.63	.21	
300 to 310	do	5.27	5	.27	End of mattress work.
310 to 320	do	4.49	4.28	.21	
320 to 330	Feb. to June, 1896.	4.76			No levels were taken in June, 1897; estimated subsidence from ½ foot to 1½ feet and over.
330 to 340	July to Dec., 1896.	5.38	.....	.....	
340 to 348	Jan. to Feb., 1897.	5.56			

NOTE.—The greatest subsidence occurred after the outer crest of the bar was passed, in from 24 to 28 feet of water.

TABLE NO. 6.—*Subsidence of north jetty.*

[Elevations show the height above mean low tide.]

Stations.	First levels taken after construction.		May, 1897.	Total subsidence to date.
		Feet.	*Feet.*	*Feet.*
0 to 10	July, 1893	6.42	6.10	0.32
10 to 20	Aug., 1893	5.60	5.17	.43
20 to 30	Sept., 1893	4.92	4.47	.45
30 to 40	Oct., 1893	5.32	4.67	.65
40 to 50	Nov., 1893	5.43	4.56	.87
50 to 60	Dec., 1893	5.34	4.75	.59
60 to 70	do	5.56	5.06	.50
70 to 80	Feb., 1894	5.68	5.16	.52
80 to 90	May, 1894	5.91	5.31	.60
90 to 100	June, 1894	5.60	5.48	.12
100 to 110	do	5.41	5	.41
110 to 120	Feb., 1895	5.21	5	.21
120 to 130	do	4.98	4.80	.18
130 to 140	Apr., 1895	5.10	4.56	.54
140 to 150	do	4.90	4.42	.48
150 to 160	do	5.20	4.24	.96
160 to 170	May, 1895	5.34	4.53	.81
170 to 180	do	5	4.66	.34
180 to 190	June, 1895	5.44	4.61	.83
190 to 200	Nov., 1895	5.40	4.53	.87
200 to 210	Dec., 1895	5.26	3.68	1.58
210 to 220	do	4.87	3.65	1.22
220 to 230	Mar. to June, 1896	5.32	4.20	1.12
230 to 240	June to Oct., 1896	4.92	3.75	1.17
240 to 250	Oct., 1896, to June, 1897	5.12	.....	.....

NOTE.—The greatest subsidence occurred after the outer crest of the bar was passed, in from 24 to 26 feet of water.

INSPECTION, CONSTRUCTION, TRANSFER, AND BARGE LINE.

The general method of inspection and construction remains as explained in previous reports, except when the exigency of the case demands, then it is modified (as in the present case on north jetty) to suit the occasion. In the reports of the Chief of Engineers will be found a full description of the plant and methods used in the progress of the work.

Appendix U, 1892, page 1529: Commencement of O'Connor, Laing & Smoot's contract. Construction of south jetty over old mattress work.

Appendix U, 1893, page 1865: Starting work on north jetty and transfer of riprap between Fort Point and Bolivar.

Appendix U, 1894, page 1391: Barge line transporting granite between Clinton and jetty.

Appendix T, 1895, page 1801: Dredging on the outer bar.

Appendix S, 1896, page 1529–36: Description and operation of U. S. dredge *Comstock*. Plant of the contractors used in construction of jetties. Scour on the outer bar with map showing area of scour and fill, and table of approximate cubic yards removed. Table of subsidence of jetties and recommencement of work on south jetty.

SURVEYS.

Monthly surveys of the outer bar, with an occasional one of the inner bar, were made as the weather permitted. In the month of August, 1896, the 24-foot curve of depth inside the outer bar met the 24-foot curve outside, and has remained open ever since, with from 24½ to 25½ feet of navigable depth. As the result of a few days' dredging on the inner bar in April, 1897, a depth of 25 feet was obtained, where formerly there was a scant 24 feet.

The annual survey was commenced on June 1, 1897, and embraces the area of Galveston Channel from Fortieth street, and Bolivar Channel from Bolivar transfer wharf to 30 feet of water in the Gulf of Mexico, including all the area between the jetties and about a half mile on the outside of each jetty from the shore to 30 feet in the Gulf.

Shore lines were run on Bolivar Peninsula from Beacon P, thence southeast to north jetty, thence around Bolivar Point to Baffle Point, and on Galveston Island from Forty-ninth street abreast of site of battery, thence northeast past the Beach Hotel and groins constructed by the city, thence along Government Reservation at Fort Point to south jetty.

On the north side of north jetty the area contained between the shore and jetty is filled up with sand, silt, and mud. In some places the sounding rod penetrated from 3 to 4 feet, but could not find the original hard bottom of sand. On the south side of south jetty over a similar area there has been filling to a lesser extent of nearly all sand.

The distance between the 30-foot contour inside to the 30-foot outside is 19,700 feet. The channel over which the dredged works is 12,000 feet long with from 24½ to 31 feet depth of water. This channel between the 24-foot contours is from 400 to 800 feet wide. It increases in width to 2,600 feet a little west of the light-ship, where there has been no dredging and where, due to the action of the jetties alone, there is a navigable depth of 26 feet to the 30-foot contour in Bolivar Roads.

The distance to 30 feet of water in the Gulf of Mexico from the end of present work, measured on the axis of jetty produced is at north jetty 3,200 feet and at south jetty 2,600 feet.

On comparison with last year's survey it is found that the 30-foot contour has advanced outside the bar from 200 to 500 feet and inside the bar 950 feet.

At the entrance to the bar channel from the Gulf the 24-foot contour has advanced 600 feet and is beginning to have the characteristics of the 18-foot contour of 1895 and 1896 south of the channel.

The 18-foot contour defining the shoal on the outer bar north of dredged channel has advanced from 150 to 600 feet, but the area has decreased one-half. The 18-foot contour south of the channel has receded about 5,000 feet and the area between the 18-foot contour of 1896 and south jetty has deepened.

The area between north jetty and dredged channel, the light-ship and outer bar has deepened. The shoal known as Light Ship Shoal has advanced and the area between it and south jetty has shoaled leaving in some places a sandy beach against the jetty. Bird Island Shoal retains its general characteristics with a shoaling between it and Bolivar.

In Bolivar Gorge and Galveston Channel the contours remain practically unchanged.

The shoreline on Bolivar, 4,000 feet northeast of north jetty, has advanced from 100 to

EXAS. JULY 14. 1897

FOR FISCAL YEAR

S OF ENGINEERS.

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400 feet. On Galveston Island on the Gulf of Mexico, abreast of Government Reservation, the shore line has advanced 200 feet, gradually approaching and coinciding with the line of 1896, 8,000 feet southeast from south jetty. Between this point and the Sixth street groin there has been an erosion, the shore line again coinciding at the root of the groin, and similarly between each groin and at each root of groin to Twenty-third street, where there is a slight accretion. The remaining shore lines on Bolivar, Galveston Island, and Pelican Spit are practically unchanged.

Very respectfully, your obedient servant,

E. M. HARTRICK, *Assistant Engineer.*

Maj. A. M. MILLER,
Corps of Engineers, U. S. A.

T 2.

IMPROVEMENT OF SHIP CHANNEL IN GALVESTON BAY, TEXAS.

The dredging of a channel through Galveston Bay was undertaken with a view of affording the commerce of the streams emptying into its northern portion an outlet to Galveston and the Gulf of Mexico.

No work was done during the present fiscal year, nor has any been done since operations were suspended September 26, 1895, as the depth of water in the channel was greater than that found in Buffalo Bayou, immediately at and below Houston, and was sufficient for the draft of vessels navigating the bay; also as Congress had indicated a possible intention of again amending the project so as to provide a channel having a depth of 25 feet instead of 12 feet.

A survey of the bay along the line of the ship channel was made in March, 1897, in compliance with an act approved February 1, 1897, public No. 38, providing for an examination and survey of a water route from the mouth of the jetties at the city of Galveston, Tex., through the ship channel and up Buffalo Bayou to the city of Houston, Tex.

Upon plotting the survey it was observed that a shoaling of from 2 to 3 feet had occurred in Morgans Cut, and that the channel in the lower bay had practically been obliterated. The amount expended during the year was principally applied to making survey.

Amount expended on this improvement to June, 1896	$789,836.85
Amount expended during present fiscal year	1,491.31
Total amount expended to June 30, 1897	800,328.16

Money statement.

July 1, 1896, balance unexpended	$50,180.00
June 30, 1897, amount expended during fiscal year	1,491.31
July 1, 1897, balance unexpended	48,688.69
Amount (estimated) required for completion of existing project	169,675.44
Amount that can be profitably expended in fiscal year ending June 30, 1899	169,675.44

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriations made by Congress for improving ship channel in Galveston Bay, Texas.

By act of—		By act of—	
June 10, 1872	$10,000.00	August 2, 1882	$94,500.00
June 23, 1874	10,000.00	August 11, 1888	100,000.00
March 3, 1875	35,200.00	September 19, 1890	132,316.85
August 14, 1876	72,000.00	July 13, 1892	40,000.00
June 18, 1878	75,000.00	August 18, 1894	50,000.00
March 3, 1879	80,000.00	June 3, 1896	50,000.00
June 14, 1880	50,000.00		
March 3, 1881	50,000.00	Total	849,016.85

COMMERCIAL STATISTICS OF SHIP CHANNEL IN GALVESTON BAY, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

It is not practicable to give the statistics of the commerce of the ship channel. Almost the entire floating commerce of Buffalo Bayou, Trinity River, and Cedar Bayou is carried through this channel, the commercial statistics being given in the reports on those works. The number of vessels passing through Morgans Canal during the year was 1,307, of which 678 were north bound and 629 were south bound.

T 3.

IMPROVEMENT OF CHANNEL IN WEST GALVESTON BAY, TEXAS.

This channel is designed to afford inside water connection between the Brazos River and Galveston, having a depth of 5 feet. Operations were suspended on October 2, 1895, at which time a channel 100 feet wide and from 3 to 3½ feet deep was available.

No work was done during the present fiscal year because a greater depth of water existed in the bay than was found in the Galveston and Brazos Canal, owned by a private corporation having the right to levy tolls, and through which most vessels plying between Galveston and the Brazos River passed.

Amount expended on this improvement to June 30, 1896 ..... $19,750.97

Money statement.

July 1, 1896, balance unexpended	$5,249.03
July 1, 1897, balance unexpended	5,249.03
Amount (estimated) required for completion of existing project	4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	4,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of appropriations made by Congress for improving channel in West Galveston Bay, Texas.

By act of—	
July 13, 1892	$15,000
August 18, 1894	5,000
June 3, 1896	5,000
Total	25,000

COMMERCIAL STATISTICS OF WEST GALVESTON BAY, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

Vessels using bay, 16 (1 steamer and 15 sailing vessels); length, 20 to 100 feet; draft, 2 to 5 feet; tonnage, 3 to 100 tons.

Amount and value of freight transported.

Articles.	Tons.	Approximate value.
Cotton	3,000	420,000
General merchandise	8,100	390,000
Total	11,100	810,000

Increase since last year, 4,725 tons.

Comparative statement for fiscal years 1895 to 1897.

Articles.	1895.	1896.	1897.
Cotton ..... tons..	2,500	1,875	3,000
General merchandise ..... do...	6,000	4,500	8,100
Total tonnage	8,500	6,375	11,100
Total value	$590,000	$442,500	$810,000

T 4.

IMPROVEMENT OF TRINITY RIVER, TEXAS.

Work at this locality is confined to the mouth and consists in constructing two jetties at the entrance known as the Middle Pass, the one generally used by vessels, with a view to deepening the water on the bar opposite it to 6 feet.

The west jetty was completed on April 6, 1894, and a channel was dredged across the bar immediately afterwards so as to afford navigation temporary relief.

No work was done during the present fiscal year, nor has there been any since operations were suspended in 1894, the construction of the east jetty having been postponed until sufficient funds were on hand to enable it to be built quickly and economically.

The amount expended during the year was $150, and was used in procuring a record of the commerce using the mouth of the river.

Amount expended on this improvement to June 30, 1896	$69,179.76
Amount expended during present fiscal year	150.00
Total amount expended to June 30, 1897	69,329.76

Money statement.

July 1, 1896, balance unexpended	$7,820.24
June 30, 1897, amount expended during fiscal year	150.00
July 1, 1897, balance unexpended	7,670.24
Amount (estimated) required for completion of existing project	15,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	15,500.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriations made by Congress for improving Trinity River, Texas.

By act of—		By act of—	
June 18, 1878	$10,000	September 19, 1890	$10,000
March 3, 1879	2,500	July 13, 1892	10,000
June 14, 1880	4,000	August 18, 1894	5,000
March 3, 1881	10,000	June 3, 1896	5,000
August 2, 1882	8,000		
August 11, 1888	12,500	Total	77,000

COMMERCIAL STATISTICS OF TRINITY RIVER, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

Vessels using the river, 29 (27 sailing vessels, 1 barge, and 1 steamer); length on deck, 30 to 100 feet; draft, 2.5 to 5 feet; tonnage, 4 to 150 tons; trips made during the year, 826; total tonnage, 10,701.

Amount and value of freight transported.

Articles.	Tons.	Approximate value.
Cotton	92	$14,864
Lumber	5,795	21,299
Coal	718	10,051
Stock	37	1,132
General merchandise	186	12,264
Total	6,828	59,606

Decrease since last year, 2,137 tons.

Comparative statement for fiscal years 1895 to 1897.

Articles.		1895.	1896.	1897.
Cotton	tons	79	27	92
Lumber	do	8,747	6,955	5,795
Coal	do	385	602	718
Stock	do	86	64	37
General merchandise	do	561	73	186
Total tonnage		9,858	7,721	6,828
Total value		$56,497	$37,846	$59,606

T 5.

IMPROVEMENT OF BUFFALO BAYOU, TEXAS.

The object of this work is to provide the city of Houston, Tex., with a waterway to Galveston and the Gulf of Mexico having a depth of 12 feet.

Work was suspended on November 4, 1895, at which time there was a depth of 10 feet in the channel, which had also been cleared of obstructions.

No work was done during the present fiscal year because there was ample depth of water in the bayou at the beginning of the cotton season to satisfy the demands of commerce, and as Congress, by act approved February 1, 1897 (Public—No. 38), had indicated a possible intention of providing a channel 25 feet deep instead of 12 feet in the bayou, and also of establishing a harbor at or near Houston 25 feet deep.

The survey called for by above mentioned act was made in March, 1897. It developed the fact that but little shoaling had occurred except directly at and for a short distance below the city of Houston.

The money expended during the year was applied to making survey and collecting the commercial statistics of the commerce using the bayou.

Amount expended on this improvement to June 30, 1896	$208,318.82
Amount expended during the fiscal year	1,417.56
Total amount expended to June 30, 1897	209,736.38

Money statement.

July 1, 1896, balance unexpended	$20,431.18
June 30, 1897, amount expended during fiscal year	1,417.56
July 1, 1897, balance unexpended	19,013.62
Amount (estimated) required for completion of existing project	156,549.75
Amount that can be profitably expended in fiscal year ending June 30, 1899	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.	

Abstract of appropriations made by Congress for improving Buffalo Bayou, Texas.

By act of—		By act of—	
March 3, 1881	$25,000	July 13, 1892	$25,000
August 2, 1882	50,000	August 18, 1894	15,000
July 2, 1884	25,000	June 3, 1896	20,000
August 5, 1886	18,750		
August 11, 1888	25,000	Total	228,750
September 19, 1890	25,000		

COMMERCIAL STATISTICS OF BUFFALO BAYOU, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

Vessels using bayou, 72 (9 steam vessels, 28 barges, and 35 sailing vessels); length, 25 to 162 feet; draft, 2 to 6.5 feet ; tonnage, 2.5 to 358 tons; trips made during the year, 2,859; total tonnage, 347,267.

Amount and value of freight transported.

Articles.	Tons.	Approximate value.
Cotton (331,066 bales)	82,767	$12,954,329
Cotton products	22,823	518,908
Coal	1,948	9,740
Lumber	2,569	39,754
Building material	10,158	18,468
General merchandise	8,789	43,103
Total	129,054	13,584,293

Increase since last year, 14,175 tons.

Comparative statement for fiscal years 1895 to 1897.

Articles.	1895.	1896.	1897.
Cotton ..... tons	128,506	78,686	82,767
Cotton products ..... do	12,595	16,672	22,823
Coal ..... do	4,758	1,660	1,948
Lumber ..... do	4,440	8,185	2,569
Building material ..... do	7,028	5,485	10,158
General merchandise ..... do	3,141	9,191	8,789
Total tonnage	160,468	114,879	129,054
Total value	$16,243,796	$14,567,872	$13,584,293

T 6.

IMPROVEMENT OF BRAZOS RIVER, TEXAS.

Under the present project the improvement of this stream is confined to the removal of snags and other obstructions from the bed and banks between Velasco and Richmond, a distance of 89 miles.

It is expected that the work, when completed, will put that portion of the river in a good navigable condition at ordinary stages of water, but the improvement will not be permanent unless the obstructions brought down on each rise in the river are removed annually.

No work was done during the fiscal year owing to the unfavorable stage of water in the river, nor has any of the appropriation been expended.

No money has as yet been expended on this improvement.

Money statement.

July 1, 1896, balance unexpended	$5,000.00
July 1, 1897, balance unexpended	5,000.00
Amount (estimated) required for completion of existing project	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1899	5,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of June 4, 1897.

Abstract of appropriation made by Congress for improving Brazos River, Texas.

By act of June 3, 1896	$5,000

COMMERCIAL STATISTICS OF BRAZOS RIVER, TEXAS, BETWEEN VELASCO AND RICHMOND, FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

Vessels using river, 33 (5 steam and 28 sailing vessels); length, 15 to 100 feet; draft, 2½ to 9 feet; tonnage, 6 to 47 tons.

Amount and value of freight transported.

Articles.	Tons.	Approximate value.
Cotton	3,750	$300.00
Cotton seed	7,500	45.00
Cattle	2,000	60.00
Lumber	450	4,00
General merchandise	1,000	35,00
Total	14,700	794,00

No comparison can be made with former years, this being the first year for which statistics were collected.

T 7.

OPERATING AND CARE OF MORGANS CANAL, TEXAS.

A watchman was stationed at Morgans Point in charge of Morgans Canal. His services were paid until October 31, 1896, from appropriation for improving ship channel in Galveston Bay, Texas; since then from an allotment of $240 made by the Department on December 2,

1896, from the permanent indefinite appropriation provided for in section 4, act of July 5, 1884.

This amount was expended as follows: James A. Black, salary, eight months at $30, $240.

Money statement.

December 2, 1896, amount allotted	$240.00
June 30, 1897, amount expended during fiscal year	240.00

Abstract of allotment made for operating and care of Morgans Canal, Texas, provided for by section 4, act July 5, 1884.

December 2, 1896	$240.00

T 8.

PRELIMINARY EXAMINATION OF CHANNEL BETWEEN BRAZOS RIVER AND GALVESTON BAY, TEXAS.

[Printed in House Doc. No. 89, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 8, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated November 16, 1896, with map,* by Maj. A. M. Miller, Corps of Engineers, upon the preliminary examination of channel between Brazos River and Galveston Bay, Texas, provided for in the river and harbor act of June 3, 1896.

From this report it appears that there exists a navigable channel 3 feet in depth from Galveston Bay to Brazos River, except through the canal of the Galveston and Brazos Navigation Company, and Major Miller states that, in view of the high estimate of value placed upon its franchise by the company, in his opinion that part of the route under examination, which consists of this canal, is not worthy of improvement by the United States. If these works could be purchased at a reasonable price, the Government would be justified in keeping the route open.

The views of the district officer are concurred in by the division engineer, Colonel Barlow, and by me.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

REPORT OF MAJ. A. M. MILLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 16, 1896.

GENERAL: In compliance with instructions contained in letter dated Office of the Chief of Engineers, United States Army, Washington,

*Not reprinted. Printed in House Doc. No. 89, Fifty-fourth Congress, second session.

D. C., June 16, 1896, I have the honor to make the following report on a preliminary examination of channel between Brazos River and Galveston Bay, Texas:

The channel between Galveston Bay, Texas, and the Brazos River may be divided into four sections: (1) Mud Island Pass, (2) Follets Pass, (3) the open waters of Oyster Bay, and (4) the canal of the Galveston and Brazos Navigation Company.

The United States has already done dredging at Christmas Point in Oyster Bay, and from Galveston Bay to this point there is a navigable channel 3 feet deep at low tide; the depth along this line of navigation varies with the height of the tide. From Christmas Point through Oyster Bay there is a channel depth of 3 feet to the mouth of the Galveston and Brazos Navigation Company's canal; this canal, forming the fourth link in the line of connection between West Galveston Bay and the Brazos River, is about 11 miles in length, is excavated partially through the waters of Oyster Bay and the mainland, utilizing the bed and waters of Oyster Creek; it joins the Brazos River about a mile above the mouth. The canal was constructed in 1850. The company constructing it was chartered under the laws of the State of Texas, and is entitled to and does collect toll from vessels using the canal. The width of the canal varies from 40 to 80 feet, the depth varying from 2 to 7 feet.

The canal is used by fishing boats, market craft, and stern-wheel river boats during the cotton season to transport the Brazos River cotton to Galveston and return merchandise. The route serves as a regulator of freight between certain Brazos River points and Galveston, as it is a competitor with the railroads.

As mentioned above, the United States has improved and furnished a channel of 3 feet depth between Galveston Bay and the eastern end of the canal; the canal company has done very little of late years to improve or deepen the canal; the property is not valuable as a private investment and would require an expenditure of about $4,000 per annum to keep a depth of 3 feet available for navigation.

In view of the high estimate of value placed upon the franchise of the Galveston and Brazos Navigation Company, in my opinion that part of the "channel between Brazos River and Galveston Bay, Texas," which consists of the canal of the Galveston and Brazos Navigation Company, is not worthy of improvement by the United States. If these works could be purchased at a reasonable price I think the Government would be justified in keeping the route open.

The report of Lieut. W. V. Judson, Corps of Engineers, who made a personal examination of this channel, is forwarded herewith, together with sketch map of channel; also letter from Lieutenant Judson to Mr. Branch T. Masterson, president of the canal company, and the latter's reply.

Very respectfully, your obedient servant,

A. M. MILLER,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
Washington, D. C., November 20, 1896.

Respectfully forwarded to the Chief of Engineers, U. S. A., concurring in the views of the district officer.

J. W. BARLOW,
Colonel, Corps of Engineers, Division Engineer.

REPORT OF FIRST LIEUT. W. V. JUDSON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., August 7, 1896.

MAJOR: I have the honor to report as follows upon a preliminary examination of the channel between the Brazos River and Galveston Bay. This examination is made in accordance with act of Congress of June 3, 1896, and in obedience to your orders.

Information upon the subject of this waterway is contained in annual reports of the Chief of Engineers as follows:

1881, pp. 1376 et seq., report on survey of the canal connecting Galveston and Brazos River, Texas.

1888, pp. 1294 et seq., report of Maj. O. H. Ernst, Corps of Engineers, to the Chief of Engineers, wherein the waterway which is the subject of this report is spoken of as affording the best outlet to the Brazos River.

1892, pp. 1563 et seq., report on preliminary examination of West Galveston Bay, Texas, from Christmas (Christians) Point, with a view of reopening the channel through West Bay.

1892, pp. 1566 et seq., report on survey of West Galveston Bay from Christmas (Christians) Point.

From the above-mentioned sources, and from the maps and sketches that accompanied them (not printed in annual reports), I gathered part of the information that follows. I spent in addition July 17, 18, and 19, 1896, in schooner and skiff ascertaining, by continuous soundings in the channel and occasional cross sections, the present condition of depth, etc. All heights and depths subsequently given are to be understood as referring to plane of mean low tide.

The waterway connecting Galveston with the Brazos River is about 38 miles long and is made up of the following parts, in order, from Galveston:

Channel through West Galveston Bay to San Luis Pass, running in southwesterly direction about 22 miles; thence to Christmas (or Oyster) Bay, through Mud Island Pass and Follets Pass, by a tortuous channel known to local navigators as "Tiddlum Taddlum;" thence mostly in a southwesterly direction through Christmas Bay to the mouth of the Galveston and Brazos Canal; thence nearly 10 miles, still generally in a southwesterly direction, to a point on the Brazos River about three-fourths of a mile above its mouth.

That part of the waterway between San Luis Pass and the Brazos River is the especial subject of this report. The parts between Galveston and San Luis Pass and also at Christmas Point in Christmas Bay have recently been improved by the United States, and funds are now available for further operations in these sections.

Below, the various links in the channel between San Luis Pass and the Brazos River are described in order:

Mud Island Pass is about 200 feet in width, 5,000 feet long, and has a present channel depth of from 10 to 15 feet.

Folletts Pass is about 800 feet wide, 9,000 feet long, and has a present channel depth of from 6 to 18 feet.

The channel through the open waters of Christmas (Oyster) Bay is about 3½ miles long. The waters of this bay (varying in the channel from 2 to 3½ feet deep) have constituted one of the shoalest links in the channel between Galveston and the Brazos River.

By the terms of act of Congress of July 13, 1892, money appropriated for improving channel in West Galveston Bay is also available for deepening the waters of Christmas (Oyster) Bay, in the vicinity of Christmas Point, where the least depth and the most tortuous course of channel have hitherto existed. At this locality, in 1895, the United States dredged a channel 1,800 feet long, 100 feet wide, and 3 feet deep. This depth can now be carried through the channel in Christmas Bay until the mouth of the Galveston and Brazos Canal be approached. This canal, which is owned by the Galveston and Brazos Navigation Company, incorporated under the laws of Texas in 1850, has its northeasterly end very indefinitely located. It has been largely dug through the very shallow waters of the southwesterly end of

Christmas Bay. It might be fair to say that the limit of private ownership is at a point about 1 mile northeast of Rattlesnake Point, which is near the point where the general 3-foot contour of Christmas Bay crosses the line of the channel. This is a tide-level canal. Through some 6 miles of its course it follows Christmas Bay and Oyster Creek. The remaining 4 miles (approximately) is excavated through land from 2 to 6 feet high.

A large part of its course through the bay is between artificial banks of shell and mud formed of the materials dredged from the cut. At several places where these artificial banks do not appear pile revetments have been used to prevent cross currents from filling the canal. These revetments are now practically destroyed from various causes. The canal was first dug in 1850–51. It was again cleared out in 1866–67. Its dimensions then are reported as 100 feet wide and 6 feet deep. In 1887 the average width was reported as 80 feet and the "usual" depth as 3½ feet. The company has done dredging at various times and places since 1866–67. At the time of my examination the width varied from 40 to 80 feet. The maximum depth in the shoalest cross sections was but 2 feet; in the deepest cross sections it was 7 feet. Nearly everywhere in the center of the channel, however, the depth was from 2½ to 3 feet. The bottom was very soft mud and to a considerable depth, probably to 6 or 8 feet below mean low tide. The banks are of shell, and mud, and clay, varying in height from 1 to 7 feet. A wagon-swing drawbridge spans the canal about 1¼ miles from the Brazos River. The pivot pier is upon the southern bank. The draw opening in the clear is 52 feet, and the clearance between the bottom of the bridge and mean low tide is about 6 feet. This bridge is in a dilapidated condition, but is still operated. A toll is charged upon vessels using the canal.

A sketch is forwarded herewith compiled from various sources, including the recent examination made by me.

During the cotton season steamboats of the river style navigate between points on the Brazos River and Galveston. In addition many market and fishing schooners and other small craft pass back and forth between Oyster Bay, San Luis Pass, and Galveston.

The project adopted by the United States for the improvement of that part of the waterway between Galveston and San Luis Pass involves dredging through all shoals to a depth of 5 feet and a width of 200 feet.

At Christmas Point the project involves dredging a channel 5 feet deep and 100 feet wide.

As a result of the work done in the past four years, there is now a channel 3½ feet deep and at least 100 feet wide from Galveston to San Luis Pass, and a channel at least 100 feet wide and 3 feet deep to the mouth of the Galveston and Brazos Canal, assuming the mouth to be located as above described.

San Luis Pass, connecting the waters of Galveston Bay and the Gulf of Mexico, has about 8 feet of water upon its bar.

The obstructions to a continuous 3-foot channel between Galveston and the Brazos River are now confined to the Galveston and Brazos Canal. The canal has been reported as being a property unproductive to its owners.

In 1887 Maj. O. H. Ernst reported (p. 1298 Annual Report Chief of Engineers, 1887) that it could probably be acquired by the United States at a nominal sum. If this is now the case, in my judgment it is worthy of acquisition and improvement by the General Government.

Economy in dredging involves the assurance of a considerable "face" or depth of cut. In a general way it may be assumed that upon the acquisition of the canal, and every four years thereafter, dredging should be done over a superficial area of about 60,000 square yards, with a depth of cut of 1 yard. This dredging could probably be done for 20 cents per cubic yard, and ought to insure 3 feet depth in the canal at all times.

If the above estimate is correct (it must be borne in mind that it is not based upon an exact survey) the maintenance of the canal would involve an expenditure of $12,000 every four years by the General Government.

Very respectfully, your obedient servant,

W. V. JUDSON,
First Lieut., Corps of Engineers.

Maj. A. M. MILLER,
Corps of Engineers, U. S. A.

LETTER OF FIRST LIEUT. W. V. JUDSON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., August 5, 1896.

SIR: Act of Congress June 3, 1896, provided for a preliminary examination of the channel between Galveston and the Brazos River. If you care to make any statement in this connection as to the terms upon which your company will transfer its

rights to the United States, and if you will kindly describe the condition and amount of commerce that are affected by your canal, please address a letter upon these subjects at your earliest convenience.

Very respectfully,

W. V. JUDSON,
First Lieut., Corps of Engineers.

Mr. B. T. MASTERSON,
President Galveston and Brazos Navigation Company, City.

LETTER OF MR. BRANCH T. MASTERSON, PRESIDENT GALVESTON AND BRAZOS NAVIGATION COMPANY.

GALVESTON, TEX., *September 2, 1896.*

DEAR SIR: In response to your favor of August 5, I beg to say that the Galveston and Brazos Navigation Company has expended, approximately, $30,000 within the last five years, improving the channel connecting the Brazos River with Galveston Bay. We recognize the fact that as the Government owns the waterway for the entire distance from Galveston to the head of navigation on the Brazos, except this canal of 11 miles in length, the interest of commerce commands that the Government should own this, so that the entire route should be improved and opened to free navigation We would be willing to convey it to the Government for $100,000, which would be much less than the actual cost of excavation, without any allowance for the franchise or right of way. Since the reopening of this line of transportation the freights for the Brazos River products seeking that outlet have been reduced very greatly—the freight on cotton from $3 to $1 per bale. The traffic has increased from 2,500 bales to 10,000 bales, and there is every prospect of a continual increase as the lands in the counties bordering on the Brazos are put in cultivation. In Brazoria County the area in cultivation has increased at least 20 per cent in this year.

Very respectfully,

BRANCH T. MASTERSON,
President Galveston and Brazos Navigation Company.

Lieut. WM. V. JUDSON,
Corps of United States Engineers.

T 9.

SURVEY FOR FURTHER DETERMINING THE CAUSES OF THE EROSION OF THE EASTERLY END OF GALVESTON ISLAND, TEXAS, AND ESTIMATING COST OF WORKS TO PREVENT SAME.

[Printed in House Doc. No. 116, Fifty-fourth Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 3, 1896.

SIR: I have the honor to submit the accompanying copy of report, dated November 16, 1896, by Maj. A. M. Miller, Corps of Engineers, upon survey directed by the river and harbor act of June 3, 1896, to be made for the purpose of further determining the causes of the erosion of the easterly end of Galveston Island, Texas, and estimating the cost of works to prevent the same.

Comparing the results of this survey with survey made in 1894, Major Miller states that the effect of the extension since 1894 of 3,000 feet of the south jetty at Galveston has almost if not quite caused a cessation of erosion at the eastern end of the island; and that it is almost certain no further erosion at that point need be apprehended. From this he considers an estimate of the cost of works to prevent further erosion unnecessary, it being evident that the south jetty affords sufficient protection.

The views of the district officer are concurred in by the Division Engineer, Col. J. W. Barlow, Corps of Engineers, and by me.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. DANIEL S. LAMONT,
Secretary of War.

LETTER OF MAJ. A. M. MILLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 16, 1896.

GENERAL: I have the honor to forward herewith a report on a survey "for further determining the causes of the erosion of the easterly end of Galveston Island, Texas, and estimating the cost of works to prevent the same."

In my opinion the construction of works for the prevention of further erosion of the eastern end of Galveston Island is unnecessary.

Very respectfully, your obedient servant,

A. M. MILLER,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
Washington, D. C., November 20, 1896.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the views of the district officer.

J. W. BARLOW,
Colonel, Corps of Engineers, Division Engineer.

REPORT OF MAJ. A. M. MILLER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 16, 1896.

GENERAL: In compliance with directions contained in letter dated Office of the Chief of Engineers, United States Army, Washington. D. C., September 5, 1896, I have the honor to make the following report on a survey "for further determining the causes of the erosion of the easterly end of Galveston Island, Texas, and estimating the cost of work to prevent the same."

Under date of August 25, 1895, I made a report on a survey "for determining the causes of the erosion of the easterly end of Galveston Island, and estimating the cost of works to prevent the same."

On November 6, 1896, I caused a survey to be made for the same purpose, a tracing* of which is forwarded herewith. This latter should be compared with that accompanying my report of August 25. (House Doc. No. 64, Fifty-fourth Congress, first session.)

The map of survey of November 6, 1896, does not extend farther westward than Sixth street, as it was found by the survey that no erosion had taken place in that direction since the survey of November, 1894. It will be seen by an inspection of the accompanying map that since November, 1894, a very slight erosion has occurred between Fourth and Sixth streets, the greatest encroachment being 87 feet at a point between Fourth and Fifth streets. At the foot of Fourth street the present shore line coincides with the shore line of 1894, and thence eastward there has been a large accretion, the maximum advance gulfward being 250 feet.

Thus it will be seen that the effect of the extension of 3,000 feet of the south jetty since 1894 has almost if not quite caused a cessation of erosion at the eastern end of Galveston Island.

The above showing makes it almost certain that no further erosion of the eastern end of Galveston Island need be apprehended.

What is stated above renders an estimate of the cost of works to prevent further erosion unnecessary.

It is evident that the south jetty affords sufficient protection.

Very respectfully, your obedient servant,

A. M. MILLER,
Major, Corps of Engineers.

Brig. Gen. W. P. CRAIGHILL,
Chief of Engineers, U. S. A.

T 10.

REPORT OF BOARD OF ENGINEERS ON CHARACTER AND VALUE OF IMPROVEMENTS MADE AT THE MOUTH OF BRAZOS RIVER BY THE BRAZOS RIVER CHANNEL AND DOCK COMPANY.

[Printed in Senate Doc. No. 138, Fifty-fourth Congress, second session.]

WASHINGTON, D. C., *February 18, 1897.*

SIR: The Board appointed to ascertain the character and value of the improvements at the mouth of the Brazos River, Texas, has the honor to submit the following report:

The instructions to the Board and the law under which it was constituted are given in the following letter from the Secretary of War:

WAR DEPARTMENT, OFFICE OF THE SECRETARY,
Washington, December 2, 1896.

COLONEL: A Board of Engineers has been appointed, in accordance with the provisions of the river and harbor act of June 3, 1896, to ascertain the character and value of the improvements at the mouth of the Brazos River, Texas, as follows: Col. H. M. Robert, Corps of Engineers; Robert Moore, C. E., of St. Louis, and Stehman Forney, United States Coast and Geodetic Survey.

You are hereby appointed president and disbursing officer of the Board.

The duties of the Board are recited in the law, which is as follows:

"For the purpose of ascertaining the character and value of the improvements made at the mouth of the Brazos River, Texas, by the Brazos River Channel and Dock Company, a Board of Engineers, one of whom shall be a civil engineer, to be appointed by the President, one a member of the Corps of Engineers of the United

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* Not printed.

States Army, to be selected by the Secretary of War, and one a member of the Coast and Geodetic Survey, to be selected by the Superintendent of the Survey, shall personally make examination of the work done by said company for the purpose of deepening the channel and removing the bar at or near the mouth of said river. It shall be the duty of the Board so constituted to report the depth of water upon the bar at the time of their examination, the character of the work done, and the cost of the same, together with the value of said work to the Government of the United States, and such other information as they may deem essential. Said Board shall report the result of their investigation to the Secretary of War on or before the first Monday in December next, and the Secretary shall immediately transmit the report to Congress, and five thousand dollars, or so much thereof as may be necessary, is hereby appropriated to pay the expenses of the said Board and for the services of the said engineer, the amount of such compensation for said services to be fixed by the Secretary of War."

The amount available for the expenses of the Board, as stated in the law above quoted, is $5,000, including the compensation of the civil engineer, which will be hereafter fixed by the Secretary of War.

Very respectfully,

DANIEL S. LAMONT,
Secretary of War.

Col. H. M. ROBERT,
Corps of Engineers, New York City.

The Board met in Washington, D. C., on December 11, 12, and 14, 1896; in Velasco, Tex., January 10–15, 1897, and in Washington, D. C., February 15–18, 1897, to complete its report.

At its first meeting the Board instructed its president to ask of the Brazos River Channel and Dock Company information on the following points:

(1) The names and addresses of the officers of the company.
(2) The name and address of the person who is authorized to represent the company in its dealings with the Board when the latter inspects the work done for the improvement of the mouth of the Brazos River.
(3) An historical statement of the work done and the results accomplished each year in connection with the effort of the company to deepen the channel and remove the bar at the mouth of the river.
(4) Such maps as will aid the Board in understanding the annual changes in the channel and bar since the company commenced its work.
(5) A full detailed statement of the character of the work done by the company for the purpose of deepening the channel and removing the bar at or near the mouth of the river.
(6) A detailed statement of the cost of the work done by the company for the purpose of deepening the channel and removing the bar at or near its mouth.
(7) Any additional facts the company may wish to present that would throw light on the question as to the value of these works of improvement to the Government of the United States.
(8) Commercial statistics, showing the number of vessels and kind, and their tonnage, both entering and leaving the Brazos River annually, since January, 1890.

The answers to these questions accompany this report, marked A.

Gen. W. W. Duffield, Superintendent of the United States Coast and Geodetic Survey, kindly offered to place at the disposal of the Board, for the purposes of this survey, the necessary field party under charge of one of the most experienced hydrographic officers of the service, Mr. H. L. Marindin. This offer was gladly accepted, as the reliability of the survey and its conformance with the other surveys of the Gulf Coast made by the Coast and Geodetic Survey was thus assured.

Mr. Marindin with his party left for the Brazos December 21, 1896, and returned to Washington January 31, 1897.

During the five days spent at Velasco, the Board personally examined the Brazos River for a distance of about 20 miles from its mouth, having the channel at the entrance sounded in its presence, and gave public hearings to all desiring to be heard on the questions before the Board.

After leaving Velasco the Board, by request, met certain gentlemen in Houston and heard their views expressed upon the importance of the work at the mouth of the Brazos River. On February 15, the Board

gave a final hearing in Washington, D. C., to the president and executive committee of the Brazos River Channel and Dock Company.

Every effort, consistent with accurate and thorough work, has been made to expedite this report, the Board being called together for its final session as soon as the results of the survey made by the coast survey party had been platted.

PHYSICAL CHARACTERISTICS OF THE BRAZOS RIVER.

The Brazos is one of the principal rivers of Texas. It rises in the northwestern part of the State and runs through the central or agricultural belt of Texas. Its length is about 800 miles, and its watershed embraces about 36,000 square miles. Its low-water discharge at Richmond, a point 70 miles above its mouth and below all important tributaries, was found by Lieutenant (now Captain) Zinn, Corps of Engineers, United States Army, in 1887, to be 800 cubic feet per second, but it is probable that it is sometimes much less. Its high-water discharge near its mouth is said to exceed 60,000 cubic feet per second.[1] The vertical range between low and high water is 42 feet at Bolivar Landing, 49 miles from the mouth; and at Waco, 430 miles from the mouth, it is 38 feet. At all stages it is navigable as far as Bolivar Landing for boats drawing about 4 feet; and in former times, before the railroad bridges which now cross it were built, small boats during high stages of the river went as far as Washington, 255 miles from the mouth. Above this point the river is obstructed by numerous shoals and rapids, which render navigation impracticable. It has no navigable tributary. The lower 16 miles has a width between banks of 300 feet at the upper end, increasing gradually to 600 feet, and a channel depth varying from 13 to 30 feet.

Unlike any other Texas river, the Brazos flows directly into the Gulf of Mexico without the intervention of a bay. Beyond the mouth the entrance is obstructed by a bar, which, before any works for its improvement were begun, had a low-water depth varying from 3 to 9 feet.[2] The position and direction of the channel were as variable as its depth. These uncertainties rendered the river practically valueless for commercial purposes, and led to the construction by the State, about 1858, of a canal about 10 miles long, leading from the river at a point, say, three-fourths of a mile above its mouth, into Oyster Bay and thence into Galveston Bay. A channel depth of about 4 feet was for a number of years maintained by dredging. Of recent years it has been somewhat neglected. In August, 1896, Lieutenant Judson, Corps of Engineers, in reporting the results of a recent examination, says that its width varied from 40 to 80 feet, with a maximum depth in cross sections varying from 2 to 7 feet, but generally from 2½ to 3 feet.

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[1] See paper on "The Brazos River Improvement," by Geo. Y. Wisner, in Transactions American Society of Civil Engineers, November, 1891, page 523. Where Mr. Wisner is cited hereafter it will be upon the authority of this paper.

[2] The investigations of the Board make it probable that the plane of reference used by the Brazos River Channel and Dock Company is the same as that used in all Government surveys previous to 1891. Mr. Marindin's survey, made under the direction of the Board, shows that the plane used by the company is five-tenths of a foot below the true mean low-water plane, as determined by the United States Coast and Geodetic Survey. Therefore five-tenths of a foot should be added to the depths stated in reports of the engineer officers previous to 1891, and the same amount added to the high-water depths given by the Brazos River Channel and Dock Company. The low-water depths stated above are taken from the report of Major Ernst, and have been corrected as above indicated. To reduce the soundings given on the maps of the company's surveys to the plane of mean low water used in the Coast Survey charts, 1.3 feet should be deducted.

FORMER PROJECTS FOR DEEPENING THE ENTRANCE.

Several projects for deepening the entrance to the river have been made prior to the one which this Board has been charged to investigate. In 1866 the Brazos Internal Improvement and Navigation Company was chartered by the legislature of Texas for the purpose of deepening the channel over the bar and improving the river, but after various unsuccessful efforts to secure a subsidy from the State the project was about 1874 finally abandoned.

The next year Capt. C. W. Howell, United States Engineers, then in charge of works on the Texas coast, reported a project for removing the bar and strongly recommended its adoption by the Government. This project consisted of two converging jetties of closely driven palmetto piles, each five-eighths of a mile long and 400 feet apart at their outer ends. In 1880, $40,000 was appropriated by Congress to begin the work.

Before the work was begun, however, Maj. S. M. Mansfield, who in February, 1880, succeeded Captain Howell, proposed an amended project, which, in September of the same year, was approved by a Board of Engineers, consisting of Colonels Tower, Newton, and Abbot, and a month later by the Chief of Engineers and the Secretary of War. This project was for parallel jetties, to consist of brush, stone, and concrete, instead of piles. They were to be carried to 18 or 20 feet of water. The approximate length of the north jetty was to be 3,600 feet, and of the south jetty 4,350 feet, and the cost was estimated at $522,890. The depth of water to be gained by the works was not expected to be more than 10 feet at mean low water. Work was begun on this project in 1881, and continued by annual appropriations until 1886, when further operations were suspended for lack of funds. Up to this time $139,831, or 27 per cent of the original estimate, had been expended. As the result of this expenditure the north (or east) jetty was partly completed for a length of 2,433 feet, and the foundation of the south (or west) jetty laid for 700 feet.

In September, 1887, Maj. O. H. Ernst, who had succeeded Major Mansfield, reported as the result of a recent survey of the works that, owing partly to subsidence and partly to the removal of the top courses by the waves or by the action of the teredo, a considerable part of the north jetty—the only one on which more than the foundation work had been done—had disappeared. As regards the results obtained in regulating and deepening the channel he found but 9 inches of water between the jetty lines, and the channel, instead of running southeast as intended, turning off at a right angle to the northeast and crossing the jetty at a point 600 feet from its outer end.

In view of these discouraging results, and in view also of the small volume of water in the river during low water and the absence of a tidal basin of sufficient magnitude to produce any considerable scouring effect, he gave it as his opinion that better results in opening the river for commerce would be obtained by deepening the Galveston and Brazos Canal, and recommended that the jetty project be abandoned. In this opinion the Chief of Engineers in a letter to the Secretary of War, dated January 11, 1888, expressed his concurrence.

THE BRAZOS RIVER CHANNEL AND DOCK COMPANY.

While this investigation was pending and before the opinion was rendered, viz, April 1, 1887, the legislature of Texas added to the general statutes a new chapter authorizing the creation of private corporations

for the purpose of constructing, owning, and operating deep-water channels from the waters of the Gulf of Mexico to the mainland and for constructing, owning, and operating docks in connection with such channels. Under the provisions of this new law there was organized February 16, 1888, the Brazos River Channel and Dock Company. By the terms of the law the new company was, so far as could be done by State authority, vested with power to construct, own, and operate a deep-water channel from the Gulf of Mexico into and along the Brazos River into the mainland as far as "may be necessary to reach a place for its docks that will afford security from cyclones, storms, swells, and tidal waves, with such depth as may suit its convenience and the wants of navigation, not less than 10 feet, and a width of not less than 40 feet."

For furnishing to vessels the facilities for navigation the company is authorized to charge and collect tolls not to exceed "1 cent per barrel bulk of the capacity of each vessel for each mile of the length of its channel used by the vessel going either way." It is also authorized to condemn and appropriate for its necessary uses and purposes the lands of any person or corporation and to hold as its right of way the "actual width of its channel and not more than 300 feet in width on each side of it, with a proviso that through arable land it can acquire by condemnation no more than 150 feet on each side from the edge or boundary of said channel." The company as a dock corporation is authorized to construct, own, and operate docks and to hold such real estate as may be necessary therefor or for the construction, use, and enjoyment of such warehouses as may be necessary to the receiving and discharging of goods and merchandise, and to collect tolls therefor. As a dock corporation, however, it is not vested with the right of condemnation.

In confirmation and further assurance of the foregoing rights and privileges, the company procured the passage by Congress of the act of August 9, 1888, entitled "An act for improving the mouth of the Brazos River," whereby the Brazos River Channel and Dock Company is authorized to construct, own, and operate jetties and other auxiliary works for the purpose of creating a navigable channel at the mouth of the Brazos River and thence into the mainland between the banks of said river, and to charge and collect tolls therefor, subject to such regulations as may be made by the Secretary of the Treasury of the United States; provided, however, that work shall be substantially commenced within one year from the date of the act; and that within three years, to wit, on or before August 9, 1891, the company shall secure a navigable depth of 12 feet of water from a point in the river beyond the reach of storms and tidal waves across the bar to a depth of 12 feet in the Gulf of Mexico, and shall secure an additional depth of not less than 2 feet during each of the three succeeding years, so that on or before August 9, 1894, a depth of 18 feet shall have been secured; any failure to comply with these conditions as to depth of water and time for any period of twelve months in excess of the time fixed as aforesaid, to work a forfeiture of all privileges under the act without action by Congress.

Section 3 of said act reserves to the United States the right to pay to the company the value of their works, either during their construction or after their completion, whereupon all right of the company to said works and to the franchises under which they were built shall cease.

In connection with the foregoing and as a part of the same enterprise, a large body of lands near the mouth of the river, amounting to about 26,000 acres, were about this time acquired by the same parties,

the title to these lands being held by the Texas Land and Immigration Company, a company incorporated under the provisions of a former constitution by a special act of the legislature of Texas, approved October 24, 1871.

OPERATIONS OF THE COMPANY.

Early in 1888 a preliminary survey of the lower Brazos and its mouth was made by the new company, the results of which were reported by Mr. E. L. Corthell, the chief engineer of the company, under date of March 31, 1888. His conclusions are the exact opposite of those reached a few months before by the Government engineers. The Galveston and Brazos Canal he finds utterly inadequate, and its maintenance "absolutely impracticable." As regards the river on the other hand he is "clearly of the opinion that a channel 20 feet deep, 150 feet wide at that depth, with a central depth of 23 feet, can be obtained at the mouth of the Brazos by the construction of suitable jetties, and that the river itself, from the landward end of the jetties to the deep pool about 3 miles above the mouth of the river, will also be deepened to 20 feet as a secondary but important result of the jetties."

His plan of the jetties was not very different from that of Major Mansfield, and was substantially the same as that already used at the South Pass mouth of the Mississippi River. It consisted of parallel jetties, about 4,000 feet long or to the 18-foot curve, made of brush mattresses sunk by loading with stone, and then crowned, for the outer half of their length, with stones weighing from 1 to 5 tons, or concrete blocks built in place. The ends were to be "solid pier heads of crib and heavy blocks of stone or concrete." He also urged the vital importance of rapid construction, in order to prevent the formation and extension of a new bar during construction and to minimize the destructive action of the waves upon uncompleted work. The final results of the work should also be assisted and hastened by dredging. In a second report, dated November 17, 1888, as the results of further study, the foregoing views are confirmed, and the opinion confidently expressed that with vigorous work a good navigable depth for the ordinary class of vessels will be obtained within twelve months from the date of commencing work, and the full depth of 20 feet, with a maximum of 23 feet, secured within two years from the same date.

After further surveys work under the plan as outlined above began March 28, 1889, and after many interruptions, and the lapse of seven years, ended April 1, 1896. During this period the work has experienced many vicissitudes. It has been carried on by a contractor, by a receiver, by a reorganization committee, and by the company. There have been three chief engineers, each of whom has resigned, and for a time the work appears to have been carried on without any engineer. As a consequence, it is not practicable now to find out exactly what has been done. It is clear, however, from the testimony of Mr. Wisner, at one time chief engineer, and others, that through mismanagement and misfortune much work and much money have been wasted.[1] The interruptions, which are fatal to economical work, and which amounted to nearly two and one-half years, would of themselves make this conclusion certain.

In a general way the work done consists of two straight and parallel jetties spaced 560 feet apart from center to center, the east jetty being 4,708 feet and the west jetty 5,018 feet long. On the inner side of the

[1] See Wisner, as above, pages 528, 529, 532, 535, 549, 550, 551.

main jetties and attached thereto wing dams or spur dikes of piles and brush loaded with shells and clay, 60 feet in length from the center lines of the jetties, have been built. These are placed about every 400 feet along the jetties and opposite to each other in pairs. The open space between the ends of each pair is, therefore, about 440 feet. The purpose of these spur dikes was to keep the channel in the center and to prevent undermining of the main jetties. The jetties themselves consist largely if not mainly of brush mattresses covered with stone. The mattresses were built in place on frames suspended from a trestle-work of piles. The lower mattresses were sunk by loading them with shells and small stones such as could be handled by one man. Larger stones were used on the upper courses, and the top, which is above water, is covered with stones weighing from one to several tons. These larger stones were placed with some care by means of a derrick, and the condition of the work, so far as it can be made out by inspection now, is fairly good. The jetties as shown by the company's maps have not been carried to the full length intended, 250 feet being lacking on the east and 350 feet on the west jetty; and nothing like a pier head has been attempted.

For the purpose of controlling and deepening the channel of the river, wing dams like those between the jetties, heretofore described, have been built out from the banks for about 5 miles upstream to the new town of Velasco.

RESULTS ACCOMPLISHED.

The result of these works, as claimed by the company and shown on their maps, has been to replace the channel depth of 6 feet, found in March, 1889, before the works were begun, by a depth of 20 feet in March, 1896.

In considering this claim it should be noted, in the first place, that the depths given are measured, not from the usual standard of mean low water, but from the plane of "average flood tide" or mean high water, by which, as hereinbefore explained, all soundings are increased 1.3 feet. The reason given on behalf of the company by Mr. Oorthell for this departure from the common usage is that in consequence of a special provision of the act of March 3, 1875, authorizing the construction of the South Pass jetties, all soundings there were referred to average flood tide, and that the same plane of reference was used by him at the Tampico jetties. But as no such provision is contained in the act authorizing the Brazos River works, and as the use of any plane but that of mean low water is to violate almost universal usage and introduce misunderstanding and confusion, we think the new custom will be more honored in the breach than in the observance, and that all soundings should be stated in the usual way. Doing this, we find that the limiting depth over the bar and between the jetties, at different dates, has been as follows:

	Feet.
March, 1889, before the jetties were begun, as reported in Mr. Wisner's paper, page 532	4.7
December, 1891, as shown by United States Coast Survey chart	14.5
March, 1896, after completion of the jetties, as shown by survey of the Brazos River Channel and Dock Company	19
January, 1897, as shown by the survey made for the Board by Mr. H. L. Marindin, United States Coast and Geodetic Survey	14.8

From these figures it appears that while between March, 1889, and March, 1896, there was a deepening due to the jetties of 14.3 feet, there has since the latter date been a shoaling of 4.2 feet. This change

in the channel depths at different seasons of the year is of the same kind as those observed by the United States engineers before the jetties were begun, and are due to the same cause, namely, the different stages of the water in the river.

The survey of March, 1896, when a channel depth of 19 feet was found, was made soon after a freshet, while that of January, 1897, when 14.8 feet were found, was made after a period of comparatively low water. Doubtless the channel depth will increase after the next freshet, and then diminish, as it has done last year. A series of observations extending through several years is necessary to determine to what extent the shoaling may go in very dry seasons, but the experience of the last year shows that the jetties alone can not maintain a channel depth of over 15 feet at mean low tide. To secure more than this at all seasons will require a resort to dredging.

The survey just made also brings out the fact that in the river about a mile above the shore end of the jetties there is a shoal several hundred feet long on which the ruling depth is only 14.3 feet. This bar is shown on the Coast Survey chart of 1889, since which time it appears to have remained substantially unchanged. Its removal will no doubt require dredging. A half mile farther up the river is another bar with a ruling depth of 13.7 feet at mean low water. Mr. Marindin's survey shows that 2 miles of dredging would be required to give a navigable channel 16 feet depth up to Velasco, one-half of this being at the entrance, between the jetties and just above.

COST OF THE WORKS.

Three estimates of cost are found in the papers submitted to the Board, two by Mr. Corthell, consulting engineer, and one by Mr. Abner Taylor, president of the Brazos River Channel and Dock Company. Mr. Corthell's first estimate is found in his report to Mr. Taylor, dated April 11, 1896; the second is given in his statement of January 9, 1897, addressed to Col. H. M. Robert, president of the Board. As these two agree substantially, the latter only need be considered. It is as follows:

Cost of jetties and auxiliary works to March 31, 1896	$1,062,342.44
Interest	375,000.00
Receiver and other legal expenses	39,500.00
Reorganization committee	80,500.00
Lee, general manager	20,000.00
Legal expenses, one-half total cost	10,500.00
Right of way along river bank	65,000.00
Railroad and terminal facilities	740,000.00
Two hotels and roadbed for electric railway	120,000.00
Artesian well, buildings, etc	18,000.00
Docks and warehouse at Velasco	24,500.00
Total	2,555,342.44

Mr. Taylor's estimate is given in his letter of December 28, 1896, to Col. H. M. Robert, president of the Board, and is as follows:

Cost of jetties and auxiliary works	$1,086,025.00
Interest to March 31, 1896, at 6 per cent	363,000.00
Total	1,449,025.00

"To which," he says, "should be added interest from March 31, 1896, to date, and also such sums, if any, as to the Board may seem proper to allow, for services of the officers of the company and general superintendence. We estimate the fair cost of the work, with interest upon

expenditures to date and a reasonable return for services, at not less than $1,500,000."

In view of this statement of Mr. Taylor, even if there were nothing more to be said, we may drop at once from the account as stated by Mr. Corthell all sums paid to the receiver, the reorganization committee, and the general manager, as well as the sums paid for the hotels, the railroad, the river right of way, etc., amounting in all to $1,118,000, and consider only the first two items, viz, the cost of the jetties and auxiliary works and interest. In Mr. Corthell's statement these items amount to $1,437,342, or $11,683 less than the figures given by Mr. Taylor. As this difference is less than 1 per cent of the total, the two accounts may, under the circumstances, be considered as in substantial agreement. For further discussion we may assume Mr. Taylor's figures, which give the largest sum, as representing the views of the company. These figures in detail are as follows:

Office building at Velasco		$3,324
Rock, 107,846 tons, at $3.015		325,178
Brush, 46,784 cords, at $1.70		79,776
Construction pay roll, including superintendent		92,866
Engineering pay roll and outfit, including instruments, preliminary and other surveys		44,173
Construction expense, including charter of tugs, wages of crew, engine supplies, coal, etc		53,756
Construction plant		30,575
Dredge		9,425
Construction supplies, driftbolts, rods, etc		6,414
Materials, iron, steel, lumber, lath yarn, etc		15,577
Piling		13,976
Clay for wing dams		920
Concrete blocks		13,960
Incidental expenses, including office pay roll, stationery, taxes, traveling expenses, properly chargeable to construction of jetties		50,327
Office furniture		1,394
Wharf at Quintana		1,677
Wharf on west jetty		750
Wharf on east jetty		564
Telegraph line, Quintana to Columbia		1,400
Artesian well at Quintana		2,656
Buildings, blacksmith shop, oil houses, etc		2,322
Office buildings		1,123
Channel improvements, dredging river, etc		12,568
Telephone line, Velasco to Quintana		135
Extra construction, amount paid Gustav Wilke at close of his contract:		
East jetty, 2,800 linear feet	$123,295	
West jetty, 3,200 linear feet	140,400	
Sixteen wing dams	7,500	
		271,195
Legal expenses		10,500
Expenses of receiver		27,500
Costs paid clerk United States court		1,000
Expenses receiver's attorney		11,000
Cost of jetties and auxiliary works		1,086,025
Interest to March 6, 1896, at 6 per cent		363,000
Total		1,449,025

The amounts charged in the above account for interest ($363,000), and for legal and receivership expenses ($50,000) should not, in the opinion of the Board, be included in the cost of the works, so far as this inquiry is concerned. Taking these out, the cost, according to the company's statement, is $1,036,025. Of this amount the payment of $271,195 the Board understands to have been made in securities. The

remainder ($764,830) was, so far as the Board's information goes, paid in cash.

That this amount in cash and securities was actually spent the Board has no reason to doubt. That much of it was unwisely spent is also beyond question.

The work was commenced under a contract with Gustav Wilke dated December 24, 1888, which led to much trouble. The difficulty was finally settled by Mr. Wilke abandoning the work and the company paying him $271,195. Mr. Wisner, the resident engineer at the time, and afterwards chief engineer, thus described some of the troubles:

> In December following (1888), a contract was let to construct the jetties and create a 20-foot channel between the Gulf and mouth of the river, the contractor to receive payments only as certain results were obtained. The work was to be done in accordance with the plans and specifications of the chief engineer of the company, but the only stipulation made as to the material to be used and the character of work was that the jetties and auxiliary works were generally to be similar to those at the mouth of South Pass of the Mississippi River. To the weakness and anomalous features of this contract may be ascribed the trouble that has harassed the company for two years, and which on two occasions has nearly wrecked the enterprise. The fact that the contractor was to be responsible for results should have carried with it the right to originate, design, and construct the works, so long as the materials used and work done were of a permanent character. On an enterprise of this kind, where unfinished work was liable to damage at all times and the results expected were dependent on unknown quantities, with the design and direction of the work resting with one party and the responsibility for results with another, a conflict was inevitable.[1]

In speaking of the first season's work, Mr. Wisner says:

> No trouble was experienced on the half mile of work lying inside of the crest of the bar, but beyond this the force of the waves was such that a more substantial structure was needed; and the contractor was surprised at the ease with which mats ballasted with 600 pounds of sandstone to each cord of brush were removed from the jetties by the waves and the material distributed for miles along the shore. [Page 528 of Mr. Wisner's paper, heretofore referred to.]

And again, when speaking of the condition of the work when discontinued in November, 1889 (p. 529), he says:

> The trestle was, however, unfortunately completed to a distance of 5,000 feet from shore on the west jetty, and 4,000 feet on the east jetty, which latter having no mattress to protect the bottom from scour, the waves cut a trench along the line of the open piling, of such a depth that the amount of mattress work finally required was nearly double that which would have been necessary if the work of jetty construction had been carried on simultaneously with that of the trestle.

To losses due to causes like these add the damages by the waves to the unfinished work during the frequent interruptions and it becomes evident that the enhancement of the cost beyond what it might have been with better management and more fortunate financial conditions must be large, but just how large it is, of course, is impossible now to tell. To rebuild the works either by the Government or by a *private* corporation with ample resources and good management would, in the opinion of the Board, cost about $600,000.

VALUE OF THE WORKS TO THE GOVERNMENT.

The last question submitted to the Board is as to the value of the works to the Government of the United States. The answer to this depends largely upon the answer given to the further question whether

[1] Page 527 of Mr. Wisner's paper, heretofore referred to.

or not there are good reasons for opening the mouth of the Brazos at all. For if not, the works, no matter what their excellence nor how great their cost, can have no value whatever to the Government of the United States.

Upon this question of the value of the Brazos River to commerce the considerations submitted by Mr. Foster, manager of the Brazos River Channel and Dock Company, are very important. There can be no doubt that the opening of the Brazos River to navigation by small boats and barges and the establishment at its mouth of a port for vessels drawing 18 or 20 feet would reduce the rates for transportation throughout the whole valley, not only on the freight actually carried by the river, but also upon all which might be thus carried, even though it might actually go by rail. The lowest rate made by any transportation line must be the rate for all. It is also highly probable, as stated by Mr. Foster, that such a port would become the terminus of new lines of railway, and thereby become an important factor in commerce without any reference to the navigation of the river. The commerce which has already come to Velasco, in spite of the uncertain and unfavorable conditions which have there prevailed, is an evidence of this. So that in the judgment of the Board there are valid commercial reasons for opening the mouth of the Brazos if it can be successfully done.

Upon the feasibility of such an opening as an engineering question, the Board, though of the opinion that a series of observations running through a period of low water in the river is very desirable, is inclined to answer in the affirmative. In times of low water in the river dredging will no doubt be required, but the appliances for this purpose have, during recent years, been so greatly improved that the cost of such work has been largely reduced. This reduction will be still greater from the fact that the work can probably be done with the same plant which the Government will have to maintain for Galveston. The experience of the last eight years has made it reasonably certain that, with the aid of dredging, the maintenance of a channel at the mouth of the Brazos with 18 feet depth at mean low tide is practicable. Whether more than this can be accomplished without an unreasonable expense the Board is not prepared to say.

But the experience of these years has also made it perfectly clear that so long as this port is in control of a private company its value to commerce must always be small. So long as there is a free port with deeper water at Galveston, 40 miles distant, it will be impossible for the Brazos River Channel and Dock Company to collect channel dues at the mouth of the Brazos. But without such dues or some equivalent tax upon the commerce of the port no company can afford to bear the burden of maintaining the channel. The magnitude of this burden is evident from the statement of Mr. Corthell, who in his letter of April 11, 1896, to Mr. Abner Taylor, president of the company, estimates the ordinary expense of maintaining the works as follows:

> In my opinion the jetties are now in such condition that within the ordinary expense of maintenance, not exceeding $50,000 per annum for five years, and not exceeding $25,000 per annum for five years thereafter, a good, navigable channel, at least 18 feet in depth, can easily be maintained with only an occasional resort to dredging. Thereafter the annual expense should not be more than from $5,000 to $10,000.

The present value of these outlays (which contain no provision for completing the jetties and building pier heads), capitalized at 5 per cent, is

nearly $400,000.[1] In view of the magnitude of this burden and the doubt as to the willingness or ability of any company to bear it, no prudent business man can afford to locate himself at this port so long as its permanence is dependent upon the fortunes of a private corporation. Until the responsibility for the maintenance of the channel is assumed by the Government the confidence necessary to invite capital and inspire enterprise will be impossible.

Another consideration affecting the value of this port to commerce is the fact that the greater part of the river front for 10 miles from the inner end of the jetties (about 19 miles of river bank in all) and the greater part of the adjoining lands, amounting to about 26,000 acres, have a single ownership. For while the Brazos River Channel and Dock Company and the Texas Land and Immigration Company are distinct corporations, they are under the same management, and, as the Board understands, are owned by the same persons. But so long as this ownership of the river front continues, competition in wharfage will be a matter of great difficulty. And so long as the present ownership of the land remains, the enhanced values, which are expected to result from the completion and maintenance of the works at the mouth of the river and which led to their construction, will accrue to a comparatively few persons. So that while this single ownership has increased the private interest in these works it has decreased the public interest therein.

To remove the objection growing out of this ownership so far as it concerns the river front, the Brazos River Channel and Dock Company, in a communication to the Board, which is appended hereto (Appendix R), have offered to dedicate to the public 1 mile of the river front either all on one side of the river or partly on one side and partly on the other. And in the opinion of the Board the making of such a dedication should be a condition precedent to any assumption of responsibility for the maintenance of the harbor by the Government.

But if this be done, it is the opinion of the Board that the maintenance of the harbor will be of a sufficient public interest to justify the Government in undertaking to complete the works and to maintain the channel at as great a depth as may be found practicable and as the interests of commerce may demand.

The Board, however, does not think that any payment for so doing should be made to the company by whom the works were constructed any more than to the many municipal corporations by whom in the past large sums have been spent in harbor construction without repayment by the Government. The taking from the company the heavy burden of the perpetual maintenance of the harbor and the securing to them the enhanced value of their lands that will follow from placing the works in charge of the Government is all that should be done.

Appended herewith is a list of the papers, maps,[2] etc., which accompany this report.

The Board, in conclusion, desires to record its appreciation of the assistance given to it by Gen. W. W. Duffield, Superintendent of the

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[1] Present values at 5 per cent of annual payments as follows:

$50,000 for five years	$216.47
$25,000 for next five years	84.[illegible]
$7,500 per year after ten years	92.[illegible]
Total	393.[illegible]

This is, presumably, for a channel 18 feet deep at "average flood tide," this being the plane of reference elsewhere used by the company.

[2] Not printed.

Coast and Geodetic Survey, in detailing Mr. H. L. Marindin, assistant, with a complete hydrographic party for making such surveys as the Board deemed necessary, and also for the aid and courtesies extended to it in the office of the Coast Survey during its final deliberations.

Respectfully submitted.

HENRY M. ROBERT,
Colonel, Corps of Engineers, U. S. Army.
STEHMAN FORNEY,
Assistant, U. S. Coast and Geodetic Survey.
ROBT. MOORE,
Civil Engineer.

The Honorable the SECRETARY OF WAR,
Washington, D. C.

(Through Brig. Gen. John M. Wilson, Chief of Engineers, U. S. A.)

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
February 19, 1897.

Respectfully forwarded to the Secretary of War.

This report is submitted under the terms of the river and harbor act of June 3, 1896, providing for the appointment of a Board of Engineers to ascertain the character and value of the improvements made at the mouth of the Brazos River, Texas, by the Brazos River Channel and Dock Company.

The act directs that "said Board shall report the result of their investigation to the Secretary of War * * * and the Secretary shall immediately transmit the report to Congress."

JOHN M. WILSON,
Brig. Gen., Chief of Engineers.

LIST OF PAPERS, MAPS, ETC., TO ACCOMPANY REPORT OF BRAZOS RIVER BOARD.

(1) Replies made by Col. Abner Taylor, president of the Brazos River Channel and Dock Company, in response to request of the president of the Board of December 15, 1896, for information relative to the company, the history of the work, etc. Appendix A.

(2) Memorandum of maps and charts, with explanatory notes, furnished by the company for the use of the Board. Accompanying this memorandum are the maps and charts, 18 in number. Appendix B.

(3) Report of H. L. Marindin, assistant United States Coast and Geodetic Survey, dated February 12, 1897, showing the physical conditions of the improvements at the mouth of the Brazos River. Accompanying this report are blue prints or tracings of the following, the originals of which are filed in the United States Coast and Geodetic Survey Office: No. 1, Brazos River jetties and river, scale 1: 50,000; No. 2, cross sections jetties, scale 10 feet to the inch; No. 3, comparative tracing submerged contour off jetties, scale 1: 10,000. Appendix C.

(4) Communication of E. L. Corthell, civil engineer, of January 9, 1897, giving the Board, in behalf of the Brazos River Channel and Dock Company, a general description of plans and materials of Brazos River jetties. Appendix D.

(5) Letter from Mr. Corthell to the Board of January 11, 1897, supplementary to his communication of January 9. Appendix E.

(6) Communication to the Board by L. L. Foster, manager Brazos River Channel and Dock Company, of January 14, 1897, on the subject of the acquisition and control by the General Government of the jetties and auxiliary works of the company. Appendix F.

(7) Approximate estimate submitted to the Board by E. L. Corthell January 8, 1897, of materials used in the Brazos River jetties and auxiliary works from the beginning of the work to the present time. Appendix G.

(8) Copies of contracts between Gustav Wilke and the Brazos River Channel and Dock Company of December 24, 1888, and January 10, 1890, for material for jetty construction. Appendix H.

(9) Copy of charter of the Brazos River Channel and Dock Company. Appendix I.

(10) Copy of charter of the Texas Land and Immigration Company. Appendix K.

(11) Copy of charter of the Velasco Terminal Railway Company. Appendix L.

(12) Letter of A. Boschke, general manager Texas Coast Canal Company, inclosing an address to the Brazos River Channel and Dock Company, on the advantages to follow the improvement of the Brazos River. Appendix M.

(13) Letter from Guy M. Bryan, of Quintana, Tex., of January 23, 1897, forwarding statement on the ownership of the frontage on the Brazos River. Appendix N.

(14) Communication to the Board from the Waco Commercial Club, of Waco, Tex., of January 28, 1897, relative to the navigation of the Brazos River. Appendix O.

(15) Memorandum furnished by Frank Caldwell, cashier Brazos River Channel and Dock Company, showing the different receiverships of the company. Appendix P.

(16) Stenographer's report of public hearing given by the Board at Velasco, Tex., January 11, 1897. Appendix Q.

(17) Letter to the Board from Col. Abner Taylor, president Brazos River Channel and Dock Company, dated Washington, D. C., February 15, 1897, on the subject of the ownership of lands by the company on the Brazos River, and making certain offers to dedicate 1 mile of the river front to public uses, provided the Government takes charge of the improvement. Appendix R.

(18) Tracing prepared by E. D. Dorchester, secretary Brazos River Channel and Dock Company, showing ownership of lands at or near Velasco, Tex. Appendix S.

(19) Blue print of Brazos River Channel and Dock Company's survey of March, 1889, before construction. Appendix T.

APPENDIX A.

LETTER OF PRESIDENT OF BRAZOS RIVER CHANNEL AND DOCK COMPANY.

VELASCO, TEX., *December 28, 1896.*

SIR: Replying to your official communication of the 15th requesting certain information of the Brazos River Channel and Dock Company, I beg to submit the following reply to the questions therein propounded, in the order in which they were presented.

NAMES AND ADDRESSES OF OFFICERS OF THE COMPANY.

(1) Directors: Abner Taylor, president, Chicago, Ill.; Horatio G. Curtis, vice-president, Boston, Mass.; Ira H. Evans, Austin, Tex.; Edmund M. House, Austin, Tex.; Charles B. Farwell, Chicago, Ill.; R. L. Heflin, New Orleans, La.; J. Otis Wetherbee, Boston, Mass.; Leverett S. Tuckerman, Boston, Mass.; John M. Edmunds, Boston, Mass.; Charles A. Vialle, Boston, Mass.; Wm. H. Coolidge, Boston, Mass.; Ernest D. Dorchester, secretary, Velasco, Tex.; J. M. Moore, treasurer, Velasco, Tex.; L. L. Foster, manager, Velasco, Tex.

(2) With the permission of the Board, Elmer L. Corthell, civil engineer, and L. L. Foster, manager, will represent the company before the Board.

(3) HISTORY OF THE WORK.

Acting under authority of the act of Congress authorizing this company to build jetties, etc., a preliminary survey of the river and Gulf was begun in December, 1888, and concluded March 7, 1889. (See map No. 1.)

Under the general supervision of Mr. Corthell and the immediate supervision of George Y. Wisner and A. E. Kastl, civil engineers, work on the construction of the jetties was begun March 28, 1889, and continued without interruption until the 1st of November, 1889. Work was suspended from the 1st of November, 1889, to the 1st of January, 1890, when it was then resumed and continued until the 1st of September, 1890.

The financial troubles resulting in the failure of Baring Bros. and others caused the company to be put into the hands of a receiver in September, 1890, and work was suspended until March, 1891. It was resumed by the receiver and carried on with a full force until July, 1891, and from that day until March, 1892, with a reduced force. From March, 1892, to March, 1893, nothing was done except to repair the jetties and to manufacture concrete blocks for use thereon. From March, 1893, to July, 1896, the work was pushed by the receiver with vigor.

From July, 1893, to January, 1895, no attempt was made to extend the jetties seaward. The only work done was in the repair of the jetties, and this only to a very slight extent.

Arrangements were made in December, 1894, for the use of the dredge known as the *Mount Waldo*, owned and used by the Mexican Central Railroad Company at Tampico, and which they no longer required. But this dredge was lost en route for Velasco with nearly all on board, including the contractor who was to have had charge of the extension of the jetties. Work was resumed actively thereafter in February, 1895, and continued without interruption until October 20, 1895. It was then suspended until January, 1896, and was then again continued until April 10, 1896. Since that date no work whatever has been done upon the jetties or in the river. The maps submitted herewith, Nos. 2 to 13, inclusive, show the depth of water and results accomplished upon the dates therein stated.

No official maps appear in our records from December 27, 1892, until March, 1896, although many soundings have been taken and charts will be produced, with the permission of the Board, showing very many soundings taken at other dates. Maps Nos. 14 to 17, inclusive, explain the condition of the channel and the jetties in March, 1896. The results obtained, as shown from the various maps, are due entirely to the construction of the jetties.

(4) Maps Nos. 1 to 17, inclusive. List annexed.

(5) CHARACTER OF THE WORK.

With the permission of the Board, Mr. Corthell and other engineers who have been in charge of the work at various times will describe to the Board its character. Map No. 18, submitted herewith, shows the general design. The coping concrete blocks were used to a very limited extent only, rock from 1 to 2 tons weight being substituted therefor. Riprap not exceeding 150 pounds for a single rock has been used instead of the shell called for in the design to weigh down the mattresses. The jetty walls are 560 feet apart. The foundation of the jetty walls has been laid 5,400 feet from the shore line, and consists of brush mattresses weighted with riprap as above described. (For design of mattresses see chart No. 18.) The jetty walls have been built up to the water line of the same material and in the same way, for a distance of 5,000 feet, and thus constructed have settled into the soft mud underlying them and constitute the foundation upon which the present jetties rest. The jetty walls, with the exception hereinafter noted, consist of a core of inner work of riprap covered by stone weighing from 2 to 10 tons each. (See map No. 16, showing cross section of jetty work.)

The east jetty has been completed 5,153 feet and the west jetty 5,050 feet. Two thousand five hundred feet of the west jetty next the shore line is partly constructed of brush mattresses. The stone used in the construction of the jetty walls is sandstone, weighing 140 to 150 pounds to the cubic foot. Twenty-four wing dams, twelve of which are on the east and twelve on the west jetty, each 60 feet in length, of the same width, slope, and weight, and constructed of the same material as the jetties, have been built between the jetty walls to concentrate the river current and increase its scouring capacity.

Beginning at a point in the river 6 miles above the entrance of the jetties, forty-two wing dams, 8 feet in width and 50 feet in length, have been constructed for the purpose of narrowing the river and deepening and straightening its channel. These wing dams are constructed of brush, elm piling, and clay.

(6) COST OF WORK.

When the company began work there was no railroad or telegraph station nearer the mouth of the river than Columbia, 36 miles distant, the terminus of the International and Great Northern Railroad. All material, except brush used for mattresses, was brought by rail to Columbia, and thence down the river in boats and barges. Brush for mattresses was obtained on or near the banks of the river from 6 to 10 miles from its mouth. To transport the material and brush barges were constructed, and a tug and other boats necessary to the prosecution of the work were purchased and chartered. A telegraph line from Columbia to the mouth of the river was constructed to facilitate communication with the sources of supply.

In February, 1892, the Velasco Terminal Railroad was completed from Chenango Junction, on the International and Great Northern Railroad, to Velasco, thus bringing railroad and telegraphic facilities within 5 miles of the jetties.

At the inception of the work the company made a contract for the building of the jetties, which contract was not fulfilled. The company itself for a short time prior to its receivership carried on the work. The receiver from the time of his appointment carried on the work and issued receiver's certificates therefor. About January 1, 1895, the various owners of the stock and indebtedness of this company appointed a committee, consisting of three of its directors, who, with the consent of the court and of the receiver, have carried on the work since January 1, 1895, until the termination of the receivership. After the termination of the receivership the company itself has been in charge of the work.

The expenditures of the company properly chargeable to jetties and channel improvement, exclusive of wharves, docks, land, and warehouses, are shown in the following list. The vouchers will be produced before the Board if desired:

Office building at Velasco		$3,3
Rock, 107,846 tons		325,1
Brush, 46,784 cords		79,7
Construction pay roll, including superintendent		92,9
Engineering pay roll and outfit, including instruments, preliminary and other surveys		44,1
Construction expense, including charter of tugs, wages of crew, engine supplies, coal, etc		53,7
Construction plant		3
Dredge		9,3
Construction supplies, driftbolts, rods, etc		6,4
Materials—iron, steel, lumber, lath yarn, etc		15,5
Piling		13,9
Clay for wing dams		
Concrete blocks		13,9
Incidental expenses, including office pay roll, stationery, taxes, traveling expenses, properly chargeable to construction of jetties		50,3
Office furniture		1,7
Wharf at Quintana		1,5
Artesian well at Quintana		2,5
Wharf on west jetty		7
Wharf on east jetty		3
Telegraph line Quintana to Columbia		1,0
Buildings, blacksmith shop, oil houses, etc		2,3
Office buildings		1,1
Channel improvements, dredging river, etc		12,7
Telephone line, Velasco to Quintana		1
Extra construction, amount paid Gustav Wilke at close of his contract:		
East jetty, 2,800 linear feet	$123,295	
West jetty, 3,200 linear feet	140,400	
16 wing dams	7,500	
		271,1
Legal expenses		10,5
Expenses of receiver		27,3
Costs paid clerk United States court		1,0
Expense receiver's attorney		11,0
Total		1,086,0

To the above should be added interest upon the amounts expended from the time of their expenditure.

This interest was computed March 31, 1896, at simple interest, 7 per cent, on expenditures prior to July, 1894	$427,3
The interest on expenditures subsequent thereto to March 31, 1896	8,3
Total	435,6

At 6 per cent this amounts to $363,000, to which should be added interest from March 31, 1896, to date, and also such sums, if any, as to the Board seem proper to allow for services of the officers of the company and general superintendence.

We estimate the fair cost of the work, with interest upon expenditures to date and a reasonable return for services, at not less than $1,500,000.

(7) GENERAL STATEMENT.

The company respectfully requests the Board to consider all communications, documents, and information heretofore submitted to the Board by Mr. Corthell as having been submitted by the company itself. At the hearings before the Board we shall desire to present statistics, documents, and testimony relative to the advantage to Texas and the entire United States of the establishment of a port of the United States at Velasco, which statistics, documents, and testimony we believe will show, among other things, the following:

First. That a deep-water harbor can be more cheaply maintained at the mouth of the Brazos River than at any other place on the Gulf Coast.

Second. That from 1832 to the present time this port has been believed by the people of Texas, and, generally, by the Engineer Corps of the United States, to be well fitted to be made a first-class deep-water port.

Third. That the river and harbor are well adapted for use for naval purposes and furnish the only land-locked harbor on the Texas coast where dry docks can be established.

Fourth. That the width of the river is greater than that of many of the largest ports of the world.

Fifth. That all necessary facilities for commerce can be easily obtained along the river front.

Sixth. That independent of the commerce tributary to existing Gulf ports in Texas, there is now a large and constantly increasing local commerce immediately adjacent and tributary to the port of Velasco that can be provided for by securing a deep-water harbor at the mouth of the Brazos River at a less cost to the Government than elsewhere; that such harbor will be more convenient, easier of access, and reached at a less cost to the commerce of a very rich and fertile territory, as large as the entire State of South Carolina, than any other Gulf port in Texas.

Seventh. That the commerce which finds an outlet through the port of Galveston, will, with the completion of the jetties and harbor facilities at Velasco, be equally well accommodated at Velasco, the rate of charges on freight from points in the interior being the same to and from each place.

Eighth. That deep-water frontage and facilities at the Gulf ports in Texas are altogether inadequate for handling the commerce already seeking an outlet through them, even though a very large portion of the commerce of Texas and the States tributary to Texas Gulf ports has, by reason of the inadequate facilities, been compelled to seek outlet elsewhere than in its natural course.

Ninth. That the rapid increase in population and growth in the commerce of Texas, and the States naturally tributary to Texas Gulf ports, necessitate additional harbor facilities, and that the situation at Velasco with reference to the commerce named renders it the only place that can supply that demand.

Tenth. That the purpose of the Government in constructing harbors for the benefit of the people in the accommodation and development of commerce can be more fully accomplished and the full benefits to the people of the work done at other ports can be better secured by opening a competitive port, thus making the port of Velasco of incalculable value to the Government and to the people.

We respectfully call to the attention of the Board the various reports heretofore made relative to the Brazos River by the United States engineers, specially referred to in the argument of Senator Farwell before the Commerce Committee of the United States Senate, a copy of which has been furnished to the Board by Mr. Corthell. Also Miscellaneous Document No. 91 of the second session of the Forty-ninth Congress, being a compilation of the "Laws of the United States relating to improvement of rivers and harbors from August 11, 1790, to March 3, 1887, with a tabulated statement of appropriations and allotments," and especially to the table of annual appropriations upon pages 435 et seq., wherein are shown the amounts appropriated for the various harbors of the United States.

From these statements and from the appropriations since that date, we believe it will appear that the average cost per foot of water obtained in the Gulf ports will not be less than $500,000 per foot.

(8) COMMERCIAL STATISTICS.

The following tables show the character and value of the commerce passing through the port of Velasco since January, 1890, so far as there is any record of the same. No definite account is kept of the character and value of the tonnage of domestic vessels of 100 tons burden and under.

Coastwise imports at port of Velasco, by calendar years.

Articles.	Quantity.	Value.
1891.		
Lumber.....feet..	8,754,334	$122,566
Shingles.....	650,000	2,600
Coal.....tons..	3,000	12,000
Railroad steel.....do...	2,634	65,850
Railroad ties.....	89,280	26,784
Bridge timber.....feet..	130,000	16,250
Railroad material.....tons..	319	12,700
Miscellaneous merchandise, estimated.....pounds..	20,000,000	530,000
Crushed rock and Portland cement.....tons..	12,207	36,621
Total.....	.....	825,371

Two steamships, twelve sail vessels, and many small craft.

Coastwise imports at port of Velasco, by calendar years—Continued.

Articles.	Quantity.	Value.
1892.		
Coal.....tons..	3,615	$14,45
Lumber, estimated.....feet..	3,000,000	42,00
Miscellaneous, estimated.....pounds..	300,000	19,00
Total.....	.....	75,45
Four sail vessels, one steamship, and many small craft.		
1893.		
Coal.....tons..	7,414	29,75
Packages, nails, barbed wire, staples, etc.....	79,695	239,08
Lumber, estimated.....feet..	1,000,000	14,00
Miscellaneous, estimated.....pounds..	350,000	21,00
Total.....	.....	303,83
Fifteen sail vessels and many small craft.		
1894.		
Tons.....	8,612	26,61
Lumber, estimated.....feet..	200,000	2,80
Miscellaneous, estimated.....pounds..	400,000	23,00
Total.....	.....	52,412
Four sail vessels and many small craft.		
1895.		
Coal.....tons..	635	2,54
Lumber, estimated.....feet..	100,000	15,00
Cotton seed and seed cotton, estimated.....tons..	1,200	13,20
Miscellaneous, estimated.....pounds..	450,000	23,00
Total.....	.....	53,740
One sail vessel and many small craft.		
1896.		
Packages nails, staples, barbed wire, wire fence, cables, etc.....	21,646	64,93
Packages miscellaneous hardware, rope, etc.....	3,858	39,00
Cases canned goods, etc.....	24,769	123,84
Cases preserved fish, etc.....	130	65
Cases drugs.....	200	2,00
Seed cotton.....tons..	400	16,00
Cotton seed.....do...	2,973	29,73
Lumber, estimated.....feet..	100,000	14,00
Miscellaneous, estimated.....pounds..	000,000	25,000
Total.....	.....	315,163
Two sail vessels and many small craft.		

Exports to foreign ports from port of Velasco by shipping seasons.

SEASON OF 1892–93.

Articles.	Quantity.	Value.
Cotton-seed cake and meal.....tons..	48,387	$1,037,871
Bales cotton, 17,869, about.....do...	4,415	810,825
Logs, 1,288, about.....do...	320	5,029
Barrels oil, 200, about.....do...	220	4,160
Total.....do...	53,342	1,857,885

Twenty-two British and other foreign steamships.

SEASON OF 1893–94.

Cotton-seed cake and meal.....tons..	60,672	$1,218,519
Bales cotton, 8,284, about.....do...	2,222	321,511
Cotton-seed oil, 8,321 barrels, about.....do...	1,895	173,000
Logs, 11,669, about.....do...	2,185	45,782
Total.....do...	66,924	1,758,812

Twenty-four British and other foreign steamships.

Exports to foreign ports from port of Velasco by shipping seasons—Continued.

SEASON OF 1894–95.

Articles.	Quantity.	Value
Cotton-seed cake and meal ..... tons..	20, 871	$384, 554
Cotton, 591 bales, about ..... do...	145	18, 246
Oil, barrels, 1,552, about ..... do...	349	18. 435
Logs ..... do...	800	2, 236
Total ..... do...	21, 665	523, 471

Nine British and other foreign steamships.

SEASON OF 1895–96.

Cotton-seed cake and meal ..... tons..	9, 835	$209, 200
Linters, 91 bales, about ..... do...	24	1, 480
Cotton-seed oil, 8,434 barrels ..... do...	772	42, 636
Total ..... do...	10, 631	253, 316

Eight British and other foreign steamships.

Coastwise exports from port of Velasco.

Articles.	Value.
1892.	
2,000 bales of cotton, estimated, value say	$70, 000
Miscellaneous, 160,000 pounds, estimated	8, 000
Total	78, 000
Steamboats and small craft.	
1893.	
Bales cotton, estimated 2,500, estimated value	87, 200
Miscellaneous, estimated 275,000 pounds, estimated value	8, 200
Total	95, 400
Steamboats and small craft.	
1894.	
Bales cotton, estimated, 2,500, estimated value	87, 000
Miscellaneous, estimated 280,000 pounds, estimated value	8, 400
Total	95, 400
Steamboats and small craft.	
1895.	
Bales cotton, estimated 3,000 bales, value say	105, 000
Miscellaneous, estimated 300,000 pounds, value say	9, 000
Total	114, 000
Steamboats and small craft.	
1896.	
Hardwood lumber, 306,000 feet	9, 205
Cotton, estimated 7,000 bales	262, 500
Miscellaneous merchandise	5, 000
Total	276, 805
One sail vessel, two steamboats (various trips), and many small craft.	

NOTE.—First. By the term "sail vessels" is meant vessels of 500 tons burden and over.

Second. By the term "small craft" is meant vessels of 100 tons burden and not over 500 tons burden.

Third. The steamer *Horatio*, 93.70 tons burden, makes regular weekly trips between the port of Galveston, the port of Velasco, and points up the Brazos River for a distance of 30 miles.

BRAZOS RIVER CHANNEL AND DOCK COMPANY,
By ABNER TAYLOR, *President.*

HENRY M. ROBERT,
Colonel, Corps of Engineers,
President Brazos River Board, Velasco, Tex.

APPENDIX B.

LIST OF MAPS.

VELASCO, TEX., *December 28, 189*.

No. 1. Entrance to Brazos River: Shore-line survey, December, 1889; soundings in river, February 20, 21, and 22, 1889; soundings in Gulf, March 4, 6, and 7, 1889.
No. 2. Entrance to Brazos River, June 21, 1889.
No. 3. Entrance to Brazos River, July 26, 1889.
No. 4. Entrance to Brazos River, September 13, 1889.
No. 5. Entrance to Brazos River, September 21, 1889.
No. 6. Entrance to Brazos River: Soundings in Gulf, November 18, 19, and 28, 188; cross-section soundings in jetty channel and river, December 3, 1889.
No. 7. Entrance to Brazos River, February 10 and 11, 1890.
No. 8. Entrance to Brazos River, soundings on bar, April 29, 1890.
No. 9. Entrance to Brazos River: At head of jetties, May 28, 1890; across bar, July 23, 1890.
No. 10. Entrance to Brazos River, soundings on bar at jetty entrance, September 11, 1890.
No. 11. Entrance to Brazos River, May 29, 1891.
No. 12. Entrance to Brazos River, July 18, 1891.
No. 13. Entrance to Brazos River, December 27, 1892.
No. 14. Brazos River jetties, March, 1896.
No. 15. Profile of jetties completed, Brazos River, March, 1896.
No. 16. Cross sections, Brazos River jetties, March, 1896.
No. 17. Comparative cross sections of jetty channel, Brazos River, before and after taking, March, 1889, and March, 1896.
No. 18. Design for jetties at mouth of Brazos River.

MEMORANDUM OF MAPS AND CHARTS, WITH EXPLANATORY NOTES FOR THE USE OF THE BOARD.

A. Survey of mouth of Brazos River under direction of Major Ernst, by H. C. Ripley, May and June, 1887. This chart was subsequently used in locating the contours of the survey made in March, 1888, by George Y. Wisner, under the direction of E. L. Corthell. The survey of 1887 shows about 1½ feet of water on the bar straight out from the mouth of the river and a crooked channel to the eastward, with about 5 feet depth. The contours and notes upon them from the survey of March, 1888, show a depth of 6 feet over the bar to the westward, with about the same depth immediately in front.

1. Mouth of the Brazos River. The shore line survey of this chart was made in 1888, December; the soundings in the river February 20, 21, 22, 1889, and the soundings on the bar and in the Gulf, March 4, 6, 7, 1889. At that time the wharves for beginning the construction of the jetties were completed. The jetties proper were begun March 28, 1889. By this chart the limiting depth on the bar was 6.1 feet at mean high tide.

NOTE.—Depths on all charts of surveys made under the direction of the Brazos River Channel and Dock Company refer to "average flood tide" or "mean high tide" of the Gulf of Mexico. The reading of average flood tide on the gauge used for reducing soundings is 1.78 (or, for convenience, 1.8 has been used). The zero of the gauge is set at mean low water. As will be seen from a note on the chart of the survey made by the United States Coast and Geodetic Survey, No. 12*a*, December 16 to 2[illegible], 1891, the plane of reference used in that survey was from daily observations made between August 1, 1890, and December 15, 1891, these observations showing that the range between mean low tide and mean high tide was 1.77, and the reading of mean low tide on the gauge used at that time was 1.84. Subsequently the gauge was set so that mean low tide should read zero, the gauge reading above and below that point. That gauge has been used to this date, having been preserved with great care, and, when necessary, the zero was transferred without possibility of error to another gauge placed on the same pile. During the last year this gauge, from want of careful attention, has become too low by about 0.5 foot.

2. June 21, 1889. This chart shows no soundings on the bar. It simply shows the local channel between the short portions of the jetties that had been completed up to that time. At the time of this survey, the west jetty had been extended from the zero point 750 feet and the east jetty 1,180 feet, both partly constructed only to those points.

NOTE.—All surveys are made under the direction of the Brazos River Channel and Dock Company unless otherwise specified.

3. Survey of July 26, 1889. No soundings on the bar, a local channel survey between jetties. West jetty was extended at that date 750 feet from zero, and the east jetty 1,350 feet.

4. Survey of channel and bar September 13, 1889. The jetties partly completed, had been built out as follows: West jetty partly constructed 4,150 feet from zero, east jetty 3,770 feet; the end of the trestle on the east jetty was at 5,064 feet. This chart shows profiles of the top of the mattress work on both jetties.

5. Survey of the bar September 21, 1889. Work on jetties is not shown; the limiting depth on the bar is 8.9 feet.

6. Survey on bar and in jetty channel and river; soundings on the bar November 18–28, 1889, in jetty channel and river December 3, 1889. The west jetty had been built up at that time about 2,840 feet and the east jetty 3,300 feet; the limiting depth on the bar was 9.3 feet.

7. Survey of the bar February 10 and 11, 1890. The jetties were in about the condition noted in No. 6; limiting depth on the bar, 8.6 feet.

8. Survey on the bar April 29, 1890. West jetty had been extended to 3,200 feet and the east jetty to 4,000 feet; limiting depth on the bar, 9 feet.

9. Survey on bar and channel, the latter May 28, 1890, and former July 23, 1890. West jetty extended 3,200 feet and the east jetty 5,450 feet, but considerable of the sea end of this distance was trestlework only; the limiting depth on the bar was 11.1 feet.

10. Survey of the bar September 11, 1890. West jetty had been extended 4,450 feet and the east jetty 5,400 feet; the limiting depth on the bar, 10.7 feet.

10*a*. Soundings on the bar and in the jetty channel March 9, 1891. Both jetties had been extended, though not fully built up, to 5,400 feet; the limiting depth on the bar was 13.3 feet.

11. Survey of the bar May 29, 1891. Both jetties as in 10*a*; limiting depth on the bar was 14.8 feet.

12. Survey of the bar July 18, 1891. The jetties same length; limiting depth on the bar, 15.5 feet.

12*a*. United States Coast and Geodetic Survey December 16 to 20, 1891. The plane of reference is mean low water; limiting depth on the bar, 15 feet; at average flood tide, 16.78 feet.

13. Survey of the bar December 27, 1892. Length of each jetty, 5,400 feet; limiting depth on the bar, 18.9 feet.

14. Survey of the channel and bar March, 1896; limiting depth in both channel and bar, 20.5 feet. The west jetty stood above surface of water at 5,050 feet, the east jetty at 5,153 feet.

15. Profile of the jetties as completed March, 1896.

16. Comparative cross sections of the channel and profiles of the channel and bar March, 1889, and March, 1896.

17. Cross sections of the jetties as completed March, 1896.

18. Design for the jetties as originally planned and not strictly followed.

19. Coast Survey chart, 1858.

20. Map of Velasco and vicinity, by Dorchester, May, 1896.

21. Larger scale map of Velasco and vicinity, showing railroad lines and projected terminals and railroad lines, by Dorchester, May, 1896.

22. Extensive survey of bar and river in three sheets, February, 1891.

23. Outline map of the mouth of the river and adjacent territory, including Houston, Galveston, and railroads.

24. Chart of survey of the bar by United States Assistant Engineer Picton, May 29, 1892.

25. Four large sheets on tracing linen of the survey of the mouth of the river and the river up to Perrys Landing, about 15 miles from the mouth, September to November, 1878. On this map were projected the wing dams proposed to be built by the Brazos River Channel and Dock Company from the mouth of the river to a point 3 miles up the river. This plan of wing dams was generally carried out. The limiting depth on the bar by this survey is 6. It was made under the direction of Maj. C. W. Howell, by Ripley and Talfor.

26. Survey of the river from the head of the jetties to Velasco, July and August, 1895. This survey shows the wing dams and the effects of the same upon the channel with river deposits near wing dams, by D. W. Spence.

27. Survey of the river from jetties to Velasco, September 2, 1895.

28. Lithograph chart of survey of the bar by Major Howell, 1883.

29. Mutilated blue print map of the channel between jetties October, 1890. Note the note upon this chart which gives the remarkable effect of the jetties with a rise in the river, deepening the channel from 10 to 18 feet to a point 1,300 feet seaward of the ends of the jetties.

30. Comparative contour chart of entrance to Brazos River, 1858, 1875, 1878, 1881 1882, 1887, with jetties proposed in 1888 by E. L. Corthell.

VELASCO, TEX., *January 8, 1897.*

APPENDIX C.

REPORT OF MR. HENRY L. MARINDIN, ASSISTANT U. S. COAST AND GEODETIC SURVEY.

TREASURY DEPARTMENT,
OFFICE OF THE COAST AND GEODETIC SURVEY,
Washington, D. C., February 12, 1897.

SIR: I have the honor to submit the following report, with accompanying tracings, showing the physical conditions of the improvements at the mouth of Brazos River, Texas, as indicated by the recent hydrographic and topographic survey made under your direction.

On receipt of a letter of instructions from the Superintendent of the Coast and Geodetic Survey, dated the 14th of December, 1896, directing me to report to you for the purpose of making a survey of the mouth of the river Brazos, and having received your authorization to organize part of the survey party from members of the Coast and Geodetic Survey then in Washington, Messrs. A. L. Baldwin, assistant, and Charles C. Yates, aid, were detailed to assist me, together with an expert leadsman from the Coast Survey steamer *Blake*.

As soon as the preparations incident to such a survey were completed, the party left Washington, arriving at Velasco, Tex., on Christmas Day, having been detained somewhat en route by a railway accident.

On arrival at Quintana, at the mouth of the Brazos, the party lost no time in recovering the plane of reference for soundings used both in the survey of 1891 by the Coast and Geodetic Survey and in that by the improvement company's engineers in March, 1896.

The permanent tidal bench mark established by the Coast Survey at Quintana in 1891, to which was referred the height of the plane of mean low water, was found in a good state of preservation, with no indication of having been disturbed since its establishment.

Three staff tide gauges were also found in position secured to piles in the vicinity of the head of the west jetty, two near the head of the jetty, and one opposite the company's office.

The two staffs at head of jetty had become useless for readings near low water from an accumulation of silt.

These three gauges were found to read so nearly alike that any one of them could have been taken as the official gauge; the one off the company's office, having sufficient depth of water, was chosen. They had been established by the company's engineers, and after the close of the work on the jetties, they were maintained by the bar pilots for the company's use and their own.

The staffs were supposed to have been set with their zero at the plane of mean low water, but on referring them to the tidal bench mark it was discovered that their zeros were an even half foot below that plane. I immediately made inquiries of the pilots and others, all of whom agreed that the gauges were in the same relative position as originally set, and that whenever it became necessary to remove one of the staffs for repainting, the others were left secured and the repainted gauge replaced at the corresponding height.

This testimony is important in view of the statement that one of these gauges was used in the survey of March, 1896, the inference being that the soundings taken then were reduced to a plane one-half foot too low.

I am unable to explain this condition otherwise than by an error having been made by the engineer in setting the original staff gauge.

TIDES.

The tides at the mouth of the Brazos during the present survey have been of the mixed type, diurnal and semidiurnal; from January 8 to 10 and 20 to 26 they were semidiurnal, and from 11 to 20 and 26 to 30 they were diurnal.

This is the case with a number of places along the shores of the Gulf of Mexico.

The mean range of tide was ascertained in 1891 from a good series of observations, including 499 observations of low water and as many observations of high water; this series gave a mean range of 1.77 feet. This is the value to be applied to the mean low-water plane to obtain that of mean high tide.

WIDTH OF STREAM.

The average width of stream between banks for that portion of the river between the head of the jetties and Velasco, without considering the contraction due to spur dikes, is 528 feet. This is reduced to 479 feet if the contraction due to wing dams is introduced. The maximum width, 902 feet, is found off Quintana near head of jetties, and the minimum width, 400 feet, off the wharf at Velasco.

Between the jetties the average width of waterway, including the contraction by

existing spur dikes, is about 476 feet. This is an approximation only, as the conditions which obtain there do not permit a very close determination.

The original project of construction for the jetties contemplated parallel jetties 560 feet between centers, with spur dikes distributed equally throughout their length. The jetties were built as intended, the foundation being composed of mattress work, loaded with small stones and finished with rocks weighing from 1 to 7 tons, in riprap. The wing dams still existing number 5 along the west jetty, and 3 along the east jetty. They were built 60 feet long from center of jetty, in opposite pairs. This gives a waterway of 440 feet in width, which, compared to the width between the outer pair, 460 feet, scaled from the chart, would indicate that these dikes have already, to a certain extent, been destroyed.

The cross sections of the jetties exhibited on the accompanying tracing (No. 2) were measured at points 1,050 feet, 3,000 feet, 4,500 feet, and 5,000 feet, as indicated by the position of the outer spur dike. These sections show an average visible width of 21.8 feet at mean low-water stage for the east jetty and 18.6 feet width for the west jetty.

It will be observed that the cross section of the west jetty at 4,500 feet shows the top barely awash at mean low-water stage. This condition obtains for some distance, and I regret not having had a favorable opportunity to measure a longitudinal section.

The length of the jetties, scaled from the topographical sheet of 1897, on a scale of 1:5000, shows the length of the west jetty 5,018 feet, and of the east jetty 4,708 feet.

The length of these jetties, taken from the blue print of the company's survey, made in March, 1896, is as follows:

Length of west jetty, 5,050 feet, which, compared to the length in 1897, indicates a loss of 32 feet in length.

The length of the east jetty is given at 4,753 feet, which, compared to length in 1897, gives a loss of 45 feet.

These measures, being scaled from the plans, are not absolutely correct; they are subject to an error in the change of scale of the paper.

CURRENTS IN THE RIVER.

The velocity of the current varies greatly with the changing stages of the water; during heavy freshets the currents are reported by the pilots to reach 7 knots per hour[1] (11 feet per second). This appears an exaggeration, and as current velocities, unless measured, are always over estimated, it may mean a velocity of 4 or 5 knots.

The currents were measured at six stations between Velasco and the mouth of the jetties on January 15, during a rising tide, with the following results:

TABLE NO. 1.

Locality of station.	Height of surface above mean low water.	Velocity of current per second.
	Feet.	*Feet.*
Mid-stream, Velasco	±0.0	0.70
Mid-stream, upper bend	+ .2	.50
Mid-stream, middle bend	+ .3	.17
Mid-stream, lower bend	+ .4	.25
Off inner red light (jetty)	+ .4	1.18
Mouth of jetties	+ .5	1.80

These current velocities, not being simultaneous, are not directly comparable, but they serve to indicate the effect of the great bend 1¼ miles above the light-house and the greater velocity between the jetties.

SURFACE SLOPES.

The observations of surface slope given in the following table were made on January 11, 1897. Five tide staffs had been established for this purpose and distributed so as to give the slopes between the following points:

Staffs 1 and 2, within the jetties.
Staffs 2 and 3, head of jetty to beginning of great bend.
Staffs 3 and 4, slope of great bend.
Staffs 4 and 5, the stretch of river up to Velasco wharf.

[1] In support of this statement Pilot L. Locke stated that he had seen a tugboat which he was certain could make 7 or 8 knots unable to make any headway against the current.

The slopes are given in Table No. 2 for each hour between 10 a. m. and 5 p. m. The mean slope per mile was 0.09 foot between the jetties, 0.16 foot between head of jetties and first wing dam below great bend, 0.03 foot in the great bend, and 0.05 foot up to Velasco wharf. The distances between the above-mentioned stations are noted in the table. The tide was on the rise till 2h 15m p. m., and on the fall to 5 p. m.

TABLE NO. 2.—*Slope of surface of Brazos River, Texas.*

[As given by the simultaneous observations of tides on January 11, 1897.]

Time.	No. 1 to No. 2.	No. 2 to No. 3.	No. 3 to No. 4.	No. 4 to No. 5.	No. 1 to No. 5.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
10 a. m.	+0.21	+0.27	+0.00	+0.15	[illegible]
11 a. m.	.16	.22	.00	.10	[illegible]
12 m.	.06	.22	.05	.15	[illegible]
1 p. m.	.11	.27	.10	.05	[illegible]
2 p. m.	.01	.17	.00	.18	[illegible]
3 p. m.	.11	.32	.05	.10	[illegible]
4 p. m.	.06	.22	.00	.18	[illegible]
5 p. m.	.01	.27	.10	.15	[illegible]
Mean	+0.09	+0.25	+0.04	+0.13	+0.5[illegible]
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*
Distance in statute miles between staffs	1.0	1.6	1.4	2.4	6.4
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Miles*
Slope per statute mile between staffs	+0.09	+0.16	+0.03	+0.05	+0.0[illegible]

The position of the tide gauges is indicated on tracing No. 1.

NAVIGABLE CHANNEL.

Shoal water is encountered almost immediately on entering between the jetties.

The first bar is reached about 2,000 feet inside of the end of the west jetty, with 14.3 feet at mean low water. This depth is found somewhat nearer the east jetty; then for about 400 feet the depth increases slightly, and a second bar with 14.8 feet is reached. These depths occupy about one-third of the channel way.

From this point on past the shore end of the jetties the depths increase somewhat, but the bottom can be called very uniformly flat. When opposite the mouth of the canal the maximum depth of 40 feet is reached. This is the greatest depth found in the river as far as examined.

Following up the channel the next bar is found, with 14.3 feet on it, at a point about 300 yards above the mouth of West Union Bayou, which is the northerly limit of the city of Quintana. The river banks are here occupied by spur dikes, 10 on the left bank and 6 on the right bank. Following the channel with somewhat deeper water, we come to another bar with 13.7 feet on it, about opposite the upper wing dam on the left bank. The channel depths then increase, following the bight of the great bend, and nothing less than 15 feet, with variations to 24 feet depth in holes, may be carried as far as Velasco.

CHANGES IN THE BANKS OF THE RIVER AND IN THE GULF SHORE LINE.

The changes in the river shore line are so great, amounting in places to one-half of the width of the river, as to cast a doubt upon the correctness of the delineation of the shores in the survey made by the Brazos River Channel and Dock Company preceding 1891, from which the shore line laid down on the chart of 1891 was obtained. A comparison of the shift of the river banks might, therefore, lead to erroneous conclusions and had better be omitted.

A comparison of the Gulf shore line with the submerged contours, at 24, 18, 12, and 6 feet depth, is exhibited on the accompanying tracing, No. 3. The survey by Major Ernst, United States engineer, in 1887, together with the surveys of 1891 and present survey of 1897, are represented.

Comparing the features of the 24, 18, and 12 foot contours of 1891 with the same in 1897, it will be observed that there has been no decided shift to seaward. This is especially the case in front of the jetties, where one would naturally look for an advance. Indeed, the evidence points to a betterment in the depths as far as the soundings went to 26 and 27 feet.

The shoal off the end of the west jetty maintains itself with practically the same minimum depth over it.

No change in the Gulf shore, as indicated by the high-water line, can be detected since 1891.

LITTORAL CURRENT.

Owing, perhaps, to persistent northeast and northerly winds during our examination, we have failed to detect any decided transverse current; but with prevailing easterly and southeasterly winds it must follow that the resultant direction of drift should be westward.

An indication of this littoral current might be inferred from an excess of accumulation of drift logs along the shores on either side of the jetties. The shores were examined with the result that nearly as much drift was found to the eastward, leaving but a suspicion that the volume was greater on the west shore.

In order to prove or disprove the existence of a littoral current at the mouth of the Brazos River, a long series of observations of the currents and tides, supplemented with meteorological observations, would be required.

In conclusion, I beg to say that with more time at the disposal of the Board, a wider scope could have been given to the survey, resulting in more complete data.

Respectfully submitted.

HENRY L. MARINDIN,
Assistant Coast and Geodetic Survey.

Col. HENRY M. ROBERT,
Corps of Engineers, U. S. A.,
Chairman Brazos River Board.

The manner of obtaining the corresponding reading of mean low tide on tide gauges Nos. 1 to 5 is given in the appended Table No. 3.

BRAZOS RIVER, TEXAS.

Simultaneous observations of tides January 11, 1897.

[Weather: Foggy; light northerly, then light southerly winds.]

Time.	Staff No. 1.	Staff No. 2.	Staff No. 3.	Staff No. 4.	Staff No. 5.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
10.00 a. m.	+1.90	+0.80	+1.55	+1.70	*a* +(0.85)
10.15 a. m.	1.90	0.80	1.55	1.70	*a* (0.85)
10.30 a. m.	1.80	0.80	1.50	1.70	0.85
10.45 a. m.	1.80	0.85	1.50	1.70	0.85
11.00 a. m.	2.00	0.85	1.55	1.70	0.80
11.15 a. m.	2.00	0.85	1.55	1.75	0.85
11.30 a. m.	2.00	0.85	1.55	1.80	0.88
11.45 a. m.	2.00	0.85	1.55	1.80	0.90
12.00 m.	2.10	0.85	1.55	1.75	0.90
12.15 p. m.	2.00	0.90	1.60	1.80	0.88
12.30 p. m.	2.10	0.90	1.60	1.75	0.92
12.45 p. m.	2.10	0.90	1.65	1.80	0.90
1.00 p. m.	2.10	0.90	1.65	1.90	0.95
1.15 p. m.	2.20	0.90	1.60	1.80	0.98
1.30 p. m.	2.20	0.95	1.65	1.84	0.95
1.45 p. m.	2.20	0.95	1.65	1.82	0.95
2.00 p. m.	2.30	1.00	1.65	1.80	0.98
2.15 p. m.	2.30	1.00	1.70	1.90	0.95
2.30 p. m.	2.20	1.00	1.75	1.90	1.00
2.45 p. m.	2.20	0.95	1.70	1.95	1.00
3.00 p. m.	2.10	0.90	1.70	1.90	1.00
3.15 p. m.	2.10	0.90	1.60	1.85	0.97
3.30 p. m.	2.10	0.90	1.60	1.80	0.96
3.45 p. m.	2.10	0.95	1.60	1.80	0.95
4.00 p. m.	2.20	0.95	1.65	1.80	0.98
4.15 p. m.	2.20	0.95	1.65	1.85	0.98
4.30 p. m.	2.20	0.90	1.65	1.85	0.97
4.45 p. m.	2.10	0.85	1.60	1.82	0.98
5.00 p. m.	2.10	0.80	1.55	1.80	0.95
Mean	2.09	0.90	1.61	1.80	0.93
Reading of mean low water	1.74	*b* 0.545	1.26	1.44	0.58

a Interpolated values.

b The value of 0.545 foot was obtained by levels between a bench mark and staff No. 2, the height of bench mark above mean low water being given as determined by a long series of tidal observations in 1891 near staff No. 2.

APPENDIX D.

LETTER OF MR. E. L. CORTHELL, C. E.

VELASCO, TEX., *January 9*, 18[illegible].

DEAR SIR: I am requested by the Brazos River Channel and Dock Company represent their interests, in association with Mr. L. L. Foster, general manager the company, and to give the Board the facts relating to the engineering features the works which you are to examine and report upon. In the way of preliminary information I submit a large number of maps, charts, profiles, and cross sections enumerated in an accompanying table, and I will now proceed at once to the general description of the plans, methods, and materials of the Brazos River jetties.

Congress, in the contract made with Capt. James B. Eads for the construction the South Pass jetties at the mouth of the Mississippi River, March 4, 1875, established the plane of reference for channel depths at "average flood tide." This plane was employed from the outset at the mouth of the Brazos River, although no plane of reference is stated in the charter authorizing the Brazos River Channel and Dock Company to build the works and obtain the depths required by the charter.

It may also be stated that, by the approval of the Mexican Government, the plane of "average flood tide" has been used in the construction of the Tampico jetties, Mexico.

For information as to the progress of the work in deepening the bar, reference is made to the accompanying list of charts which, as far as is practicable, gives the length of each jetty constructed at the time each survey was made, and also the limiting depth on the bar. These two are contemporaneous conditions, and show the relation, in a measure, between the works and their results.

As will be seen from the reports of the company, the contract made with Gustav Wilke for the entire work was not based on unit prices, but he was to receive a lump sum for the building of the works, that were to be similar to those constructed at the mouth of the Mississippi, and was to be paid as depths of channel were secured. As this contract was never completed, but was set aside and Wilke settled with arbitrarily in December, 1889, the cost of the work in units is not known. The engineers in charge kept as careful a record as it was possible to do under the circumstances of the materials that went into the work under this uncompleted contract, and these approximate amounts of materials have been used in making the statement of materials in the work.

It is necessary in this statement simply to refer to the financial vicissitudes, the change of contractors and receivers, and of the engineers, from time to time, covering a period of nearly seven years, during probably more than one-half of which period the work was not under any really engineering supervision. The Board will appreciate the difficulty under these circumstances of providing it, for its study of this subject, with precise and reliable details. The following remarks emphasize this feature:

DATES OF WORK AND SUSPENSION AND RESUMPTION OF SAME.

March 28, 1889, the jetties proper begun; work proceeded to November, 1889, at which time the contract of Gustav Wilke was abrogated.

November 1, 1889, to January 1, 1890, the work was suspended.

January 1, 1890, to September 1, 1890, the work was continued by the Brazos River Channel and Dock Company, or really by Lee and Ferguson.

September 1, 1890, to March 1, 1891, work suspended and property in the hands of the receivers, Angle and Caldwell. This receivership was made necessary by the failure of a Boston company which transacted the financial business of the Brazos River Channel and Dock Company.

March 1, 1891, to July, 1891, the work was carried on vigorously by the new receivers Angle and Wilke.

From July, 1891, to March, 1892, it was carried on with a reduced force. The receivership of Angle and Wilke extended from February, 1891, to January, 1892.

Mr. Angle became receiver in January, 1892, and acted as such until March, 1893.

From March, 1892, to March, 1893, the work was carried on very irregularly, most of it consisting of repairs, simply, and making concrete blocks.

From March, 1893, to July, 1893, the work was carried on quite vigorously.

From July, 1893, to January, 1895, the extension of the jetties seaward was suspended, and the work consisted mostly of repairs.

From February, 1895, to October 20, 1895, the work was continued seaward and the sea ends built up and the work put generally into fair repair.

From October 20, 1895, to January, 1896, the work was suspended.

From January, 1896, to April 10, 1896, the ends of the jetties were again built up and the entire work consolidated. During the latter periods above mentioned the financial management of the works was in the hands of a reorganization committee in Boston, whose relations to the work will be explained elsewhere.

Since April, 1896, to the present time, January 8, 1897, practically no work has been done.

According to the original plans, which appear on Plan No. 18, above referred to, it was intended to build the jetties largely from a trestle, and to construct the mattresses on this trestle for the purpose of avoiding delays and disarrangement of the work which would result from doing the entire work by a floating equipment. However, shortly after the work was begun it was found practicable to lay barges alongside of the work on the channel side, and the plan was accordingly modified. The mattresses, instead of being built on the trestle on tilting ways, were built under the trestle and suspended from it over the water. The sea was generally sufficiently smooth to allow a continuous mattress to be built, sometimes 200 to 300 feet in length, the rear end of it being dropped into the water while the forward end was still suspended to the trestle. This trestle was generally about 30 feet in width, and it was possible to build a mattress under it and suspended from it from 2 to 4 feet in thickness and 50 feet in width, or wider where necessary, and this width varied according to the depth of water and the position of the mattress.

The brush was not generally willow, such as was used at the mouth of the Mississippi, where the willows were straight and flexible and made solid work, which compressed very little under leverage and weight of stone. The brush was obtained from along the banks of the Brazos River. It was sometimes necessary to go from 5 to 7 miles from the river, and even then the material was not well suited to such work, being stiff, often crooked and almost impossible of compression by levers. These conditions added largely to the cost of the work, not only on account of the difficulty of handling, carting, and transporting, but on account of the large proportion of voids in the work. Even after the brush was compressed mechanically in the mattresses, it led to a very considerable compression when the weight of stone was placed upon it. From careful investigations made upon similar work at Tampico, the mattresses at the Brazos and the brush work generally compressed at least 50 per cent of its measurement on the barge, and probably 30 per cent of its measurement in the mattress before sinking. It is unnecessary to go into the details of the construction of these mattresses. The brush was held in place by a framework of pine scantlings, sometimes poles, above and below, which was connected through the mattress by iron rods and galvanized-iron wire. The bundles of brush after being cut in the woods were tied up with lath yarn. It was only necessary to hold the brush together until the rock, or shell, or clay, or whatever was used to weight it down, should be placed upon it, except of course the top layer of mattresses, which required much heavier weighting than the lower tiers of the work.

As will be seen by the statement of materials used, an attempt was made on account of the great expense of stone to use shells from the immediate neighborhood and clay under certain conditions. These latter materials were found suitable, but not where there was any exposure to the work in a seaway.

During the earlier period of the work, there was no way of bringing suitable stone to the work except by means of the International and Great Northern Road to Columbia, about 37 miles from the jetties, and boating it down from there on barges. The loading of the stone on the steep banks of the river, which had a rise of nearly 30 feet between high and low water, was very difficult and expensive. In the later period of the work, the company had completed its railroad from Velasco to Chenango Junction, about 20 miles, and the rock was thereafter brought to the bank at Velasco, and more conveniently handled onto barges from the cars. The rock, with the exception of a small amount obtained from vessels coming in in ballast, was brought from three stations: Quarry Station, on the Gulf, Colorado and Santa Fe Railroad, 145 miles from Velasco; Riverside, on the International and Great Northern Railroad, 139 miles from Velasco; and Muldoon, on the Aransas Pass Railway, 217 miles from Velasco.

As will be seen from the charts, the distance between the center lines of the jetties, which are straight and parallel their entire distance, is 560 feet. In order to place the channel in the center of the space between them and to prevent any possible undermining of the jetties, wing dams or spur dikes were designed, and have been built about 60 feet in length from the center line from each side and about every 400 feet along the jetties, and placed in pairs opposite to each other. These wing dams were built of piles, brush, and generally of clay or shells, very little rock being used upon them. They were simply intended to form a sufficient obstruction to the current at flood river, when the water is heavily loaded with sediment, to cause a deposit above and below the wing dams; and it was expected that this sediment would soon fill solidly the interstices of these wing dams, and the expectation was realized.

It may also be stated at this point that the wing dams, as will be seen from the various charts referred to and submitted, were necessary in order to deepen and control the channel of the river the entire distance from the landward end of the jetties to Velasco, about 5 miles. An examination of the charts will show that these wing dams have performed their work very effectively, the shore in many cases being built out to the outer end of the wing dams, and often almost burying them, establishing a

new river bank at many of the reaches where the width was too great to maintain the depth of 18 feet, which it was attempted to procure and maintain.

The following is as close an estimate of the material used in the works as can now be made:

Brush, 82,307 cords, equals	cubic yards..	38[illegible]
Clay and shell	do....	11[illegible]
Rock	tons..	124[illegible]
Concrete in blocks and coping	cubic yards..	[illegible]
Piling	linear feet..	20[illegible]
Lumber in trestles, etc	feet, B. M..	2,05[illegible]

The cost of the work, taken from the books of the company and distributed, is as follows:

Jetties and auxiliary works to March 31, 1896.

Office building, Velasco	$3,32[illegible]
Rock	339,00[illegible]
Brush	81,476[illegible]
Construction pay roll	92,86[illegible]
Engineering outfit, pay roll, and obligations	44,17[illegible]
Construction expenses	53,77[illegible]
Construction plant	30,57[illegible]
Dredge	9,42[illegible]
Construction supplies	6,41[illegible]
Materials	15,57[illegible]
Piling	14,265[illegible]
Clay	95[illegible]
Concrete blocks	13,960[illegible]
Incidentals	50,327[illegible]
Office furniture	1,394[illegible]
Wharf, Quintana	1,67[illegible]
Artesian well	2,65[illegible]
Wharf, west jetty	75[illegible]
Wharf, east jetty	564[illegible]
Telegraph line	1,400[illegible]
Buildings	2,322[illegible]
Office buildings	1,123[illegible]
Channel improvements	12,568[illegible]
Telephone line	135[illegible]
Extra construction amounts paid Gustav Wilke at close of his contract	271,195[illegible]
Legal expenses, one-half of total expense	10,500.00
Total	1,062,342.44

There are certain other general expenses properly chargeable to the works:

Interest	$375,000.00
Receiver	27,500.00
Dart, clerk United States court	1,000.00
Wilson, attorney of receivers	11,000.00
Lee, general manager	20,000.00
Cost committee reorganization and general and incidental expenses	80,500.00
Total	515,000.00

There have also been expended certain amounts, all of a commercial nature, which may not be properly chargeable to the jetties and auxiliary works, or channel improvements, at the mouth of the Brazos River, but have furnished necessary terminal facilities:

Legal expenses, one-half of total cost	$10,500.00
Right of way along the river bank between the jetties and Velasco	65,000.00
Railroad and terminal facilities	740,000.00
Two hotels and roadbed for electric railway	120,000.00
Artesian wells, buildings, etc	18,000.00
Docks and warehouses at Velasco	24,500.00
Total	978,000.00
Grand total of the entire expense	2,555,342.44

The above costs will be found stated in the communication[1] of the writer dated April 11, 1896, to the president of the Brazos River Channel and Dock Company.

[1] Not printed.

The office accounts at that time were made up to include February 29, 1896; work was under way at the time, consolidating the jetties, and there should be added to the totals of cost at that time of jetties and auxiliary works $15,797.74 for stone, brush, and piles.

It was stated on page 8 of the above communication that there had been used for the construction of the works the following materials:

About 3,000 piles, 47,000 cords of mattress and brush work, and about 110,000 tons of rock. The figures that were furnished the writer at that time did not include the materials used in the original contract of Gustav Wilke prior to the company itself taking charge of the work. The approximately correct totals of the above materials are as follows: 202,000 linear feet of piles, or over 6,000 piles, instead of 3,000; 82,306 cords of brush, or 380,216 cubic yards, instead of 47,000 cords; 124,762 tons of rock, instead of 110,000 tons.

A detailed statement of materials used is submitted herewith for reference.

The physical and engineering features of this subject have been so fully stated in various reports to the company and to other persons that reference to them and submission of them to the Board for examination will make it unnecessary to discuss the matter at this time. (See report[1] of E. L. Corthell, chief engineer, to William M. D. Lee, March 31, 1888, to be found on pp. 19 et seq., prospectus of the Brazos River Channel and Dock Company; also a letter[1] by Mr. E. L. Corthell to Mr. Lee dated November 17, 1888, pp. 26–29 of the same prospectus; also a communication,[1] made after examination, by Mr. Corthell, to other parties, dated May 14, 1892. As this is a private report, it is submitted to the Board for its confidential use. Also the report[1] already in your hands made by Mr. Corthell to Col. Abner Taylor, president Brazos River Channel and Dock Company, April 11, 1896.)

In reference to the permanency of the works and securing and maintaining a 20-foot navigable channel through the jetties to deeper water in the Gulf, the attention of the Board is called to the fact that due to inability of the owners of the property to raise the necessary means during the last year the jetties throughout their entire length have not been maintained everywhere above the surface of the water, particularly at the sea ends of the works. The Board can itself decide what will be required to raise these works above the surface to the sea ends of the foundations as laid at about 5,400 feet from the initial point, if it should be considered necessary by the Board, and can form its own conclusions as to the cost of maintenance in the future.

As to dredging as an auxiliary in obtaining and maintaining the channel, it may be truthfully stated that what little has been done has been of no practical importance. In other words, the channel that now exists and that has existed for some years was obtained and has been maintained by natural forces. During the time of the original contract the contractor, in order to hasten channel results, endeavored by dragging chains and anchors over the bar, and by some dredging in advance of the work, to accelerate these results, but the appliances were very inefficient and accomplished nothing practical. During the last two years a small hydraulic dredge with a 10-inch suction pipe has been tried upon the bar, but it was altogether unadapted to such work and the results were inappreciable. The company at one time chartered a suitable hydraulic dredge for the works having two 15-inch suction pipes, but it was lost at sea in transit to this place. It may be proper to suggest to the Board the question and the cost of not only maintaining a 20-foot channel through the jetties and the bar, but of making and maintaining a still deeper channel, as has been done and is now being done satisfactorily and within the limits of economy at several points in this country and in Europe.

The entrance channel to New York Harbor, with which the Board is perfectly familiar, has been deepened to 30 feet with hydraulic dredging, and the channel has been maintained; and there is a project now for deepening it to 35 feet, by probably the same means. At the mouth of the South Pass, Mississippi River, a hydraulic dredge is employed to maintain the channel by removing temporary deposit due to unfavorable river conditions.

At Galveston the results being now obtained by hydraulic dredging are too well known to the Board to need more than a reference.

At the Soolina mouth of the Danube, where the conditions and the size of the channel obtained without dredging, as here, are very similar, both as to sedimentary and tidal conditions and in depth of channel, it has been found necessary to deepen the channel artificially in order to accommodate the size of ships that desire to enter. A powerful hopper dredge was built for the purpose, and the depth of the channel has been increased from about 20½ feet to 26 feet without any extension of the jetties seaward. A considerable portion of this dredging is done outside or beyond the ends of the jetties.

At Liverpool, after several years of discussion as to whether it was practicable to build jetties over the sea bar, it was decided to attempt dredging without jetties and

[1] Not printed.

a very powerful hydraulic dredge was built for the purpose, and from results already obtained there is no doubt that the original depth of 11 feet at mean low water will be increased to 30 feet, or at least to 28 feet, so that the ocean liners can enter at any time of the tide, as they now do at New York.

The conditions effecting the removal of sediment discharged from the mouth of the jetties and the maintenance of an artificial channel beyond them are as favorable at the mouth of the Brazos River, and perhaps more so, than at the mouth of the Soolina.

Examinations now would not probably show the full amount of material, rock and brush particularly, that has gone into the works since March 28, 1889, when they were begun. The description of the brush used will indicate that there has been (by the weight of rock as well as by the impact of waves during the five or six years that the material has been there) a great deal of compression. The deposit of sand on the easterly side of the east jetty and of sedimentary matters on the westerly side of the west jetty, and the large deposit also of sedimentary matter between and around the wing dams on the inside of both jetties, make it impossible to trace the full slopes of the works.

From the amount of material that has been placed in the works, and from a knowledge of the disposition of the material, made not only by those in charge but by the waves, there is given an assurance that there exists a broad stable foundation for the superstructure the entire length of both jetties, and leads to the belief as well that there has been very little settlement into the bottom.

In reference to the foreshore beyond the ends of the jetties, personal experience of the writer at the mouth of the Mississippi and at Tampico, where works somewhat similar to the Brazos works, and under somewhat similar conditions have been constructed under his supervision, confirms him in the belief, expressed in his report at the outset of the Brazos works, that if the works are maintained well above the surface of the water, the littoral and wind and wave currents, with a predominating westerly movement, will not only prevent any reformation of the bar, but will exert a greater effect in wearing away the present bar than the fluvial deposits will have in advancing it.

The commercial features are fully stated by the president of the company and by my associate, Mr. Foster, general manager of these works, from careful and continued study of these conditions during the last seven years. I fully concur in these statements, believing them to be conservative.

I am, sir, yours, respectfully,

E. L. CORTHELL.

Col. HENRY M. ROBERT,
United States Engineers, President Brazos River Board.

APPENDIX E.

LETTER OF MR. E. L. CORTHELL, C. E.

VELASCO, TEX., *January 11, 1897.*

DEAR SIR: I submit herewith three copies of three statements relating to the engineering and physical features of the question submitted to you for report. Also 33 maps, charts, etc., 18 of which are already in your hands, or en route from Washington from the president of the company. If these 18 are not received in time, the originals are at the disposal of the Board; also any notebooks and record books in the engineer's office that the Board may wish to examine, and in respect to costs of work the books of the auditor, Mr. F. Caldwell, are open to inspection for the purpose of verifying the statements submitted by the company, and Mr. Caldwell himself will assist the Board if they should desire it.

It is proper to call attention to slight differences between the cost of various parts of the works submitted by the president of the company and myself. The statement furnished by him does not include certain expenditures during March, 1896; interest since March 1, 1896, appears in his statement and does not in mine; also the costs are analyzed and grouped somewhat differently, as will be seen.

Mr. Foster, general manager, will furnish as soon as can be compiled certain historical and other facts in support of the general commercial propositions made by the president of the company.

In the way of explanation, it should be stated that the communication herewith submitted and dated January 9, as well as the two accompanying statements, were compiled before the statement by the president of the company was received on Saturday.

I am, sir, yours, respectfully,

E. L. CORTHELL.

Col. HENRY M. ROBERT,
President Brazos River Board.

APPENDIX F.

LETTER OF MANAGER OF BRAZOS RIVER CHANNEL AND DOCK COMPANY.

VELASCO, TEX., *January 14, 1897.*

SIR: I assume that the acquisition and control by the General Government of the jetties and auxiliary works constructed at and near the mouth of the Brazos River by the Brazos River Channel and Dock Company, under authority of an act of Congress, depends upon two propositions:

1. The practicability of constructing a harbor at the mouth of said river commensurate with the demands of the territory and commerce to be accommodated thereby.

2. The volume and importance of the commerce that would be affected by the construction of said harbor.

The first proposition is an engineering problem which will be discussed by Mr. E. L. Corthell, authorized by the Brazos River Channel and Dock Company to represent them before your Board.

On the second proposition the following facts, statements, and observations are respectfully submitted:

By reference to the commercial statistics heretofore submitted by the Hon. Abner Taylor, president of the Brazos River Channel and Dock Company, it will be seen that the foreign and domestic commerce transported through the mouth of the Brazos River from January 1, 1892, to December 31, 1896, inclusive, amounted in value to $6,532,879. During the period named the time and means of the projectors of the enterprise were devoted to the work of development preparatory to handling commerce, and comparatively little effort was made to turn commerce through the port of Velasco. The business done, therefore, was such as, in the main, voluntarily sought a market through this port, and is only a very small part of the commerce that would, with deeper water and proper facilities for handling, seek an outlet here.

In February, 1892, the Velasco Terminal Railroad was completed to Chenango Junction, 20 miles distant, where it intersects the International and Great Northern Railroad, and furnishes rail connection between Velasco and all railroad points in the State. By the opening of the rail line a considerable amount of the commerce that had theretofore found its way to Velasco and points up the Brazos River by water was diverted to the rail line. The apparent diminution in the water traffic between 1891 and 1897 is accounted for by that fact. The volume of trade has constantly increased, and the amount handled by the terminal road, that had before its opening sought an outlet through the river, has correspondingly increased.

For the bulk of the import and export commerce of Texas a harbor capable of admitting vessels of 20-foot draft will answer every purpose, and the completion of the jetties and deepening of the channel to 20 feet or more will result in turning through this port a very large additional business, on account of its being the natural channel for such business, and for other reasons which I shall hereafter mention. There has not been at any time since the inauguration of the enterprise a favorable opportunity to develop the shipping interests at Velasco, various and sundry hindrances, fully set forth in other papers and documents before you, having retarded progress along that line.

The commerce actually handled by water during the period named, when the improvements were in process of construction and no efforts to secure business were being made, is a fair indication of what could be done under favorable conditions.

The Brazos River penetrates the heart of the agricultural region of Texas. Lying along its banks and for many miles distant is the richest and most fertile soil to be found anywhere in the United States. The annual output of agricultural products in the territory alluded to is enormous; but for the purposes of this discussion I shall confine myself to counties having a water frontage on the Brazos River from its mouth to the city of Waco, a distance of 402 miles north. By reference to the map of Texas you will see that the following is a list of such counties: Brazoria, Fort Bend, Waller, Austin, Washington, Burleson, Grimes, Brazos, Robertson, Milam, Falls, and McLennan. According to the census of 1890 these counties contained a population of 242,279. There has undoubtedly been an increase in the population since 1890 of 10 per cent, which would make the present population 266,558. These counties contain 9,851 square miles of land, nine-tenths of which is cultivable. According to the report of the State bureau of agriculture for 1894, which is the last published, they also contain 14,577 farms, which grew agricultural products in quantity and value as follows:

Quantity and value of agricultural products grown in 1894 in counties having a re frontage on the Brazos River from its mouth to Waco.

Articles.	Quantity.	Valu
Cotton.....bales..	425,242	$
Corn.....bushels..	8,196,362	
Oats.....do....	914,558	
Sweet potatoes.....do....	465,237	
Irish potatoes.....do....	41,553	
Sugar.....barrels..	42,895	
Hay.....tons..	26,668	
Wool.....pounds..	169,409	
Total.....	.....	

To this should be added the following:

Value of horses, cattle, sheep, and goats for the same year, as shown by re report, $5,959,257. The value of the lumber, machinery, general merchandise, an other products not grown or manufactured in said counties would amount to not les than $5,000,000, so that the combined value of the agricultural products, live stock and imports in the counties named for 1894 amounted to $26,093,147. It is not claimed that this amount in value of commerce was exported and imported, this summary being given for the purpose of showing the population and producing capacity present and prospective, of the counties that would unquestionably be directly an immediately affected by the deepening of the harbor at the mouth of the Brazos River. All of the cotton, sugar, wool, and lumber, amounting in value to $15,344,[illegible] was handled by various transportation lines. A considerable percentage of the corn potatoes, hay, and live stock also sought a market in the same way. Skirting the banks of the Brazos River, and in some places widening out many miles, there is a vast, and I may say almost unlimited, quantity of valuable timber, consisting of ash cottonwood, pecan, sycamore, oak, hickory, elm, basswood, hackberry, box elder a considerable quantity of holly, cedar, and walnut, and other timber suitable for manufacturing purposes, that would be brought into use by the completion of the improvements at the mouth of the river and its opening, even for a limited distance to navigation.

The commercial interests of counties bordering the river and adjacent thereto, as far as navigation would be insured by the opening of the harbor at its mouth, without additional expense, except for removing snags, would alone justify the expense necessary to acquire and improve it. These counties are Brazoria, Fort Bend, Wharton, Matagorda, Austin, Washington, Waller, Grimes, and Brazos. The value of the agricultural products in these counties amounted to over $18,000,000 in 1894. It should also be remembered that the territory above described, while comparatively well populated for a new country, is still in a large measure undeveloped. There is probably not one-third of its area under cultivation.

Situated along the Brazos River bottom and within a distance of 50 miles from its mouth there are twelve large sugar plantations, with modern machinery for sugar making, and also one of the largest sugar refineries in the United States. There are also many smaller sugar farms and factories, all making rapid progress in development. Competent judges estimate the area of territory lying immediately adjacent to Velasco and capable of sugar production, as being equal in extent and quality to the sugar-growing district of Louisiana.

By reference to the various reports of Government engineers detailed to examine the mouth of the Brazos River with a view to its improvement by the Government it will be seen that they have, in the main, been favorable to such improvement. In 1881 a Board of Engineers, consisting of Generals Tower, Newton, and Abbot, recommended the expenditure of over half a million dollars for that purpose, and between that date and 1884 $142,098.43 was actually expended by the Government on the undertaking. It is to be presumed that the commercial feature of this question was then considered, and that the several engineers and Boards that passed upon the question thought the commerce to be accommodated by the opening of the port sufficient to justify the expense necessary to do the work. If it was warranted then how much more so now, when the commerce of a dozen counties within 100 miles of the mouth of the river amounts to more than the commerce of fifty of the wealthiest counties in the State then did.

So far I have confined my facts and statements to the proposition that, independent of any general commerce that would seek an outlet through the port of Velasco there is a local territory and commerce sufficient to justify the Government in entering upon a scheme of improvement for their accommodation. I now propose to present for your consideration a few facts and observations bearing on the importance

to the entire State of the acquisition, control, and development by the Government of the Brazos River harbor.

The commerce of Texas, as a whole, and of the Western States, now seeking an outlet through the Gulf, does not belong to any particular locality. It is as much the commerce of the port of Velasco, within the limit of that port's capacity to handle it, as it is of the port of Galveston or the port of New Orleans, and will seek a market, foreign or domestic, through the port that offers the greatest advantages and along the line of least resistance. Already the commerce of the entire State seeking an outlet through Galveston, and more than half of the Texas commerce that goes through New Orleans, converge at the city of Houston, the railroad center of south Texas, 60 miles distant from Velasco, and from which place to Velasco there is direct transportation by rail. Rates of charges by rail from all points in Texas to Velasco are the same as to Galveston; and what is now needed is the deepening of the harbor at Velasco to a point where it will be a competitive outlet to all commerce of a local and State-wide character, to insure to the people of Texas the full benefit of the expenditures already incurred in securing deep water at Galveston as well as any that may be made for harbor improvements at Velasco. The benefit of opening competitive outlets to market is well illustrated in the effect on grain rates of securing deep water at Galveston. Your Board is doubtless aware that deep water at Galveston has resulted in a material reduction in grain rates from the grain-producing territory to foreign markets; and competitive ports such as New York, Baltimore, and other grain-shipping points are considering means by which port charges may be reduced and grain rates lessened so as to retain their trade. Not only do the shippers through the port of Galveston enjoy the benefit of this reduction in freight charges, but shippers in general, no matter by what route they may ship.

At present the port of Galveston is practically without competition in Texas. The entire water frontage at Galveston is owned by the Galveston Wharf Company, whose right to charge tolls or wharfage on the commerce passing across its wharves is protected by the constitution of the State of Texas, and not subject to legislative restriction or control. Its charter was obtained by the Republic of Texas, and the privileges therein granted were protected against abridgment by subsequent action of the legislative power by the constitution of 1876. (See Art. XII. sec. 7, constitution of the State of Texas, under the head of "Vested rights protected.") Such is not the case at Velasco. In the first place, the town of Quintana owns about 3,000 feet of river front near the mouth of the river, and various individuals own water frontage at other points. But if the entire water frontage were owned at Velasco or any other port except Galveston by one individual or corporation the right to charge wharfage or a toll on commerce would be subject to legislative control; and the people, in the exercise of their authority through the legislative power, could find relief from any wrong or injustice in port charges.

In addition to a diversity of ownership of water frontage at Velasco and the fact that the right to levy tolls on commerce passing through the port is subject to legislative control, the Brazos River Channel and Dock Company has leased to various persons water frontage for a long term of years at a nominal rental and with the right to erect their own wharves for the accommodation of their own business. (See map showing ownership of water frontage on Brazos River and adjacent thereto; also number, location, and duration of leases of water frontage made by Brazos River Channel and Dock Company.) There is therefore not even a remote possibility of a wharf monopoly at Velasco. But, in the event that the Board should deem these safeguards against a monopoly of river frontage and wharf privileges inadequate, I would suggest that in the act providing for the acquisition of the jetties and other auxiliary works a clause be inserted providing that, should there be a disagreement as to terms between the Brazos River Channel and Dock Company and railroads or manufacturing companies desiring water frontage, the matter be referred to the Secretary of War for final determination, and that both parties abide by his decision.

The effect of opening the harbor at the mouth of the Brazos River on rail rates would be to materially reduce them at all points reached by navigable water. Barges drawing from 2 to 4 feet could be floated down the river from a point 250 miles distant from its mouth; and, with a comparatively small expenditure in river improvement, a much greater distance. The mouth of the Brazos is the only point in Texas where the opening of a harbor capable of accommodating vessels of 20 feet draft or more would result in any material reduction in the rates and charges on freights to and from Gulf ports in the State, for the reason that it is the only port into which flows a navigable stream or a stream capable of being made navigable for any considerable distance. No reduction in rail charges to the seaboard from Texas points followed the opening of a deep-water harbor at Galveston, nor will such a result follow the opening of any other port on the Texas coast except at Velasco. The effect of the opening of said port, and of the river, to navigation, as far as it may be found practicable, on the rates of freight charges is illustrated by its effect

on such charges from points where the river is now navigable. The railroad commission rate on cotton in bales is 43 cents per 100 pounds, or $2.15 per bale of 500 pounds for a distance of 100 miles. Columbia, a point on the Brazos River 100 miles from Galveston, can reach Galveston by both water and rail transportation. Cotton is carried from that point to Galveston by water for 20 cents per 100 pounds, or $1 per bale of 500 pounds. Velasco, on the Brazos River, also has both water and rail transportation to Galveston. The distance from Velasco to Galveston by rail is 110 miles, and the railroad commission rate on cotton for that distance between points in Texas not affected by water transportation is $2.25 per bale of 500 pounds. But the water lines carry a 500-pound bale of cotton from Velasco to Galveston for 80 cents, and the rail line must do likewise or surrender the business to the water carriers.

There is therefore $1.15 per bale saved to the producer on every bale of cotton shipped from Columbia to Galveston, and $1.45 per bale on all shipments from Velasco to the same point, as compared to the railroad commission rates for a like distance by reason of water competition. Fifteen thousand bales of cotton were produced in Brazoria County in 1896, on every bale of which the prodncer saved between $1 and $1.25 per bale in freight charges on account of its proximity to the navigable part of the Brazos River.

The influence of the Brazos River on freight rates is felt as far north as Richmond, a distance of about 100 miles from its mouth, though there is no actual shipping from that point down the river. Cotton may, however, be hauled down the river and shipped by water to the Gulf. The distance by rail from Richmond to Galveston is 64 miles, and the railroad commission rate on cotton for that distance is $1.45 per bale of 500 pounds, but by reasan of water competition it is necessary for the railroad companies to carry it for 75 cents per bale.

The railroad commission rate on a 500-pound bale of cotton from Waco to Galveston, a distance of 236 miles, is $3.25. From Brenham to Galveston, a distance of 110 miles, it is $1 95 per bale. The opening of the Brazos River to navigation by barges as far north as Brenham, where there is little, if any, doubt of its practicability would materially reduce freight rates to all points north as far as Waco and to points west of the river. Rates to the Gulf would then be made by adding the river rate from the point of origin to the head of navigation on the river and the water rate thence to the Gulf together, the combination forming the through rate to the Gulf. By making the river navigable from tide water to Waco a sum not less than $1,000,000 a year would be saved to the people of the Brazos Valley from Waco south in freight charges, and rates to all pionts in north Texas would be reduced more or less, according to distance from Waco. It is not necessary for commerce to actually move along a certain route for that route to exercise a controlling influence on freight rates. The Mississippi River well illustrates this point. Though only a very small part of the commerce of the Mississippi Valley now finds its way to market on the bosom of the Father of Waters, there is not a pound of freight originating near it or that crosses it on its destination to or from market the charges on which it does not exercise either a controlling or a modifying influence upon. So it would be with the Brazos River in Texas. It would be the greatest factor in the State in the regulation and control of freight charges, and there is no part of Texas that would not feel its beneficial effects were it opened to navigation even as far north as the Houston and Texas Central Railroad crossing, near the town of Brenham.

I do not hesitate to express the opinion that the saving in freight charges, compared to present rates on cotton, cotton-seed products, lumber, and other commodities that would be affected within a period of three years would pay all expenses necessary to obtain a 20-foot channel to the sea and open the river to barge transportation as far north as the crossing of the Houston and Texas Central Railroad, about 250 miles from its mouth. Within that distance the following railroads cross the river: Gulf, Colorado and Santa Fe; New York, Texas and Mexican; San Antonio and Aransas Pass; Galveston, Harrisburg and San Antonio (Southern Pacific); Missouri, Kansas and Texas; Texas Western; and Houston and Texas Central. The freight charges on cotton and other like commodities on all of these lines would be materially affected by opening the river to navigation as above suggested.

The cotton and other commodities would not all go to market by the water, but would be moved by the rail lines at rates fixed by the water route.

I do not believe that the people of Texas, and particularly of the upper Brazos Valley, have ever fully comprehended the meaning and effect of the opening of the Brazos River to navigation as far as it is practicable, though from the earliest period in Texas history the Brazos River has by common consent been regarded as susceptible of navigation for a considerable distance from its mouth. This opinion found expression in an act of the legislature of 1858 appropriating $60,000 for its improvement, and also subsequently at various periods down to the present time in resolutions of boards of trade, memorials, petitions, etc., to the legislature of the State and to Congress requesting an appropriation for its improvement.

RAILROAD FACILITIES AT VELASCO.

As before stated, one rail line now reaches this port from Houston, where the principal roads of the State center. Other lines also contemplate securing an outlet here, and are awaiting the results of efforts to secure permanent deep water before taking further action. The San Antonio and Gulf Shore Railroad, whose charter calls for this point, is now under construction, has already completed 30 miles of its line, and has contracts out for the construction of 12 additional miles. The Gulf and Brazos Valley Railroad, whose southern terminus will be Velasco, has contracted for the construction of the first 25 miles of the line between Jacksboro and Mineral Wells, Tex. By reference to the map of Texas it will also be seen that a line of railroad 75 miles long, parallel with the Brazos River and following its course, would cross every important system of railroad in Texas.

Should the Government undertake the work confidence in its ultimate success would be at once inspired; and, however slow the progress of the work at first, investors in railroad and other enterprises would not hesitate to secure a foothold here and push their enterprises to completion.

In addition to what I have heretofore stated in regard to the ownership and control of water frontage at Galveston by the Galveston Wharf Company, I desire to add that the space capable of being utilized for docks and wharves at Galveston is limited; and there are physical difficulties in the way of an increase of shipping facilities there that act as an obstruction to the prompt and free movement of commerce. The result is a congested condition of traffic demanding relief, which can be obtained here at a less cost to the Government than elsewhere. Indeed, it is doubtful if additional facilities at Galveston can be provided except on space already overcrowded with commerce.

In alluding to the control of the water frontage at Galveston I do not wish to be understood as expressing an opinion that there is an abuse of the privileges enjoyed by the wharf company at Galveston. It is immaterial to the port of Velasco what charges are levied on commerce elsewhere, but it is a self-evident proposition that competition in outlets to the Gulf will secure to the producer the benefit of the lowest rate of wharf and other port charges at which commerce can possibly be handled.

The data and statements submitted, referring to the beneficial results of river improvement, may appear irrelevant so far as the subject immediately before the Board is concerned; but in view of the far-reaching influence on commerce that part of the river already navigable would exercise in freight charges to and from interior points in the event the Government should secure deep water at its mouth it is difficult to draw the line of distinction and avoid discussing, incidentally at least, the effect on commerce of the improvement of the river. The improvement of the river is out of the question unless the Government first secures control of the harbor at its mouth, and Government control of the harbor will immediately be followed by Government control and improvement of the river.

As a harbor of refuge for vessels in time of storm the Brazos River has no equal in the Gulf coast in Texas, and for that purpose it is invaluable to the Government. During every stormy period vessels near enough to its mouth seek refuge in the river, and so far as history gives an account no vessel has ever been wrecked in the river by storm.

L. L. FOSTER,
Manager Brazos River Channel and Dock Company.

Col. HENRY M. ROBERT,
President Brazos River Board, Velasco, Tex.

APPENDIX G.

Approximate statement, by Mr. E. L. Corthell, C. E., of materials used in Brazos River jetties and auxiliary works from beginning of work to January 8, 1897.

Piling:		Linear feet.
March, 1889, to December 1, 1889		100,413
January, 1890, to February 29, 1896 (3,096 piles)		100,000
March 1, 1896, to March 31, 1896 (55 piles)		1,650
Total		202,063
Lumber and timber in trestles, wharves, etc., at jetties:		Feet B. M.
March, 1889, to December, 1889		1,827,796
March 25, 1890, to September 9, 1890	$5,840.21	
September 10, 1890, to March 31, 1891	867.70	
April 1, 1891, to January, 1892	14,527.89	
	21,235.80 at $9	225,000
Total		2,052,796

Brush:	**Cords.**
March, 1889, to November, 1889	35,037
February, 1890, to September, 1890	28,103.5
October, 1891, to November, 1892	14,824.9
February 26, 1895, to March 31, 1896	4,341.3
Total	82,306.7
Cubic yards	380,216
Rock:	**Tons.**
March, 1889, to November, 1889	11,500
February, 1890, to September, 1890	20,133
October, 1891, to November, 1892	41,694
February 25, 1895, to January 8, 1897	51,435
Total	124,762
Clay and shell:	**Cubic yards.**
To December 7, 1889	10,279
To March 31, 1896	946.44
	11,225.44

Concrete blocks:

June 30, 1892, to December 31, 1892	$10,555.04
January 31, 1893, to December 31, 1893	1,463.97
Labor and handling	761.28
12,780.29 at $17	750

E. L. CORTHELL.

VELASCO, TEX., *January 8, 1897.*

APPENDIX H.

CONTRACTS BETWEEN MR. GUSTAV WILKE AND BRAZOS RIVER CHANNEL AND DOCK COMPANY.

Articles of agreement, made and concluded this 24th day of December, A. D. one thousand eight hundred and eighty-eight, by and between Gustav Wilke, of the city of Chicago, State of Illinois, and his executors or administrators, party of the first part, and the Brazos River Channel and Dock Company, a corporation duly and legally incorporated under and in accordance with the laws of the State of Texas, party of the second part, witnesseth:

That for and in consideration of the payments and covenants hereinafter mentioned to be made and performed by the said party of the second part, the said party of the first part doth hereby covenant and agree to furnish all necessary materials, boats, barges, and plants, and to construct such permanent and sufficient jetties and such auxiliary works, such as dikes, levees, wingdams, etc., and to do such dredging as may be necessary to create and maintain, as hereinafter set forth, a navigable channel at the mouth of the Brazos River, Texas, between said river and the Gulf of Mexico, and so far into the mainland and between the banks of the said Brazos River as may be necessary to create a channel twenty (20) feet deep and 100 feet wide at that depth from the deep pool above the contemplated cut-off in the Brazos River, to a depth of 20 feet in the Gulf of Mexico, outside the bar, and to maintain a channel of said dimensions for a period of twelve months from and after the creation of said channel, all in accordance with the following conditions, to wit:

1. That all work shall be done in accordance with the plans and specifications and under the supervision of the chief engineer of the second party or his authorized assistant, and the measurements, estimates, decisions, and channel certificates of the said chief engineer shall be final and binding upon the parties hereto. It is understood that the jetties and auxiliary works herein mentioned are generally to be similar to those at the mouth of the South Pass of the Mississippi River. It is understood that all engineering expenses shall be paid by the second party.

2. That the plane of reference to which shall be referred the depth of the channel mentioned in this contract shall be the average flood tide as shall be determined by the chief engineer from the observations which he shall make.

3. That the second party shall give the first party the right to take and use in said jetties and auxiliary works, and for other purposes connected therewith, any suitable timber and brush growing or standing upon their land, excepting such live oak as may be found on the land of the second party above what is known as the "Brown

tract," and further excepting all timber of any kind on land below the above-named tract.

4. The second party agrees to give the first party the use of the banks and any portion of said river below the place known as "Sea View" for dock facilities, but it is agreed that the use of the land and river for said purpose is not in any way to obstruct its free navigation.

The second party agrees to give the first party free occupancy of any land it may own for his boarding houses, shops, warehouses, mattress ways, plant, and for all other purposes of a like nature required for the rapid and economical prosecution of said works and their construction. This occupancy apply only to lands owned by the second party lying below "Sea View," and it is further understood that the second party may at any time enter upon said lands for the purpose of making improvements, providing the same does not interfere with their use as granted to the first party.

5. Time.—It is further agreed that the work under this contract shall be substantially commenced within ninety days from the date of execution of this agreement and shall be prosecuted with all reasonable dispatch to the intent that said jetties and auxiliary works may be completed and the channel herein mentioned may be created within two years after the execution of this agreement; and these limits as to time are understood to be essential conditions of this contract and binding upon the first party.

6. The chief engineer, or his authorized assistant, shall have authority to discharge disorderly or inefficient foremen or other employees of the first party engaged in said work, if, in his judgment, their presence or employment upon the works is detrimental to its character, progress, or interest, provided the first party fails to discharge them upon his request to do so.

7. In consideration of the foregoing stipulations and conditions the second party covenants and agrees to pay to the first party, upon the certificate of the chief engineer, for performing the work mentioned in this contract the following sums of money and bonds:

When a channel 12 feet in depth without regard to width shall have been obtained from a channel of said depth in the river at the deep pool above the contemplated cut-off to said depth in the Gulf of Mexico outside of the bar, two hundred and fifty thousand ($250,000) dollars; when a channel fourteen feet in depth and fifty feet in width shall have been obtained, one hundred thousand ($100,000) dollars in cash and fifty thousand ($50,000) dollars in the first mortgage bonds of the Brazos River Channel and Dock Company; when a channel sixteen feet in depth and fifty feet in width shall have been obtained, one hundred thousand ($100,000) dollars in cash and fifty thousand ($50,000) dollars in bonds; when a channel eighteen feet in depth and seventy-five feet in width shall have been obtained, one hundred thousand ($100,000) dollars in cash and fifty thousand ($50,000) dollars in bonds; when a channel twenty feet in depth and one hundred feet in width shall have been obtained and maintained for twelve months, one hundred thousand ($100,000) dollars in cash and fifty thouand ($50,000) dollars in bonds; the aggregate amount of payments for the entire work as above specified being six hundred and fifty thousand ($650,000) dollars in cash and two hundred thousand ($200,000) dollars in bonds. The bonds herein mentioned are to be secured by first mortgage upon all the rights, franchises, and property of the Brazos River Channel and Dock Company, consisting of the jetties at the mouth of the Brazos, the docks and warehouses on the banks of the Brazos, the land for dock purposes, at least one hundred and fifty feet in width along both banks of the Brazos River for ten miles from its mouth, the right to collect channel and dock tolls; in short, all its rights and franchises conferred either by the charter from the State of Texas or the act of Congress of the United States, and all the property it may acquire either by purchase, condemnation, or construction during the existence of the mortgage.

The said bonds are to be still secured by a first mortgage upon about twenty-seven thousand acres of land lying on each side of the Brazos River at and near the mouth of said river.

If the second party so elects, it may make all of the bond payments, or any part of them, in cash.

It is further agreed that when the jetties and auxiliary works herein mentioned in the river shall have been completed to a depth of twelve feet of water on the outside of the bar in the Gulf of Mexico, the second party shall make an advance of one hundred and fifty thousand ($150,000) dollars in cash to the first party, the same being understood to be an advance on the first payment above mentioned for obtaining a channel of twelve feet in depth.

It is hereby stipulated and agreed by and between the parties hereto that if default for thirty days shall be made in the payments of the several sums of money, or in delivery of the bonds to be paid and delivered to the party of the first part as hereinbefore provided, or in each of them, then the party of the first part may declare

the contract ended and determined without notice to the party of the second part, and shall be determined to recover from the party of the second part any and all damages he may have sustained by reason of any such default on the part of the party of the second part.

8. That all payments made as heretofore provided for are in contemplation of the final completion of this contract within the limit of time as prescribed herein, and it is understood that all such payments, except the last and final payment as provided for, are simply advances upon the work, and are not considered as earned by the party of the first part until the completion of the entire contract contemplated herein, namely, the creation of a chanuel twenty feet deep and one hundred feet wide at that depth, as above specified, and the maintenance of said channel as provided for in this contract.

9. The first party agrees to maintain the intermediate channel depth and width herein mentioned until this contract is terminated, the same to be done at his expense, but under the direction and supervision of the chief engineer of the second party or his authorized assistant; and the first party further agrees that no temporary structures, plant, floating equipment, or other means employed by him in the prosecution of his work shall hinder, delay, or materially interfere with the free navigation in said river or between said river and the Gulf of Mexico, and he further agrees to be responsible for all damages arising from his failure to comply with the above conditions.

10. It is understood in general that all requirements of the act of Congress dated August 9, 1888, for improving the mouth of the Brazos River shall be fully complied with by the first party so far as they relate to this contract.

It is further agreed that the first party shall not assign this contract to other parties nor transfer nor sublet any part of the same, except so far as relates to materials, unless upon the sanction and approval in writing of the chief engineer of the second party.

In case the work is at any time suspended for a period of more than thirty days, either by death or disability of the first party, or for any other cause, it is expressly understood that the second party may take entire possession and control of the work and of its entire equipment and materials and of the force employed and may prosecute the work at the expense of the first party, or of his executors or administrators, until such time as the first party or his executors or administrators are fully prepared to take up the work and carry it forward vigorously, it being understood that the object of the above provision is to insure from the start the continuous and rapid prosecution of the work until its completion, such method of work being considered as of vital importance to its success.

In witness whereof the said parties of the first part hath hereunto set his hand and seal in duplicate the day and year first above written, and the said the Brazos River Channel and Dock Company of Brazoria County, Texas, has caused its corporate name to be hereunto signed in duplicate by its president, for that purpose duly authorized, and its corporate seal to be hereunto affixed by its secretary the day and year first above written.

GUSTAV WILKE.
THE BRAZOS RIVER CHANNEL AND DOCK COMPANY,
By WM. M. D. LEE, *President.*

Witnesses:
E. L. CORTHELL.
W. J. KARNER.
Attest:

J. M. FERGUSON,
[SEAL.] *Secretary Brazos River Channel and Dock Company.*

For value received I hereby surrender and cancel the within contract, and hereby release the Brazos River Channel and Dock Company and also the guarantees, Abner Taylor and Lee & Ferguson, from all and every obligation whatever arising under or by virtue of said contract. And I hereby deliver to the said the Brazos River Channel and Dock Company the jetties constructed, together with all material of every kind, tools, machinery (except dredge), telegraph line, and steam tug belonging to me, and warrant the same to be free from all claims whatever.

Witness my hand this 18th day of January, A. D. 1890.

GUSTAV WILKE.

Witnesses:
G. W. ANGLE.
ALEX DELGADE.

GUARANTY.

We, Abner Taylor, of Chicago, Illinois, and William M. D. Lee and John M. Ferguson, parties doing business under the firm name and style of Lee & Ferguson, of Leavenworth, Kansas, for a valuable consideration to each of us in hand paid by

Gustav Wilke, of Chicago, Illinois, the receipt of which is hereby acknowledged, the moving consideration for the execution of this contract by said Wilke being a guaranty hereunto set forth do hereby jointly and severally guarantee the faithful performance on the part of the party of the second part of all and singular the provisions, agreements, and stipulations in the foregoing contract contained to be done, fulfilled, and performed by said party of the second part, this instrument of guaranty to be executed and delivered contemporaneously with the duplicate contract delivered to said Wilke and to be construed in connection thereto.

LEE & FERGUSON.
ABNER TAYLOR.

Witnesses for Lee & Ferguson:
E. L. CORTHELL.
W. J. KARNER.

Memorandum of agreement made this tenth day of January, A. D. 1890, by and between Gustav Wilke, of Chicago, Illinois, party of the first part, and the Brazos River Channel and Dock Company, party of the second part, witnesseth:

That party of the first part, for and in consideration of the sum of three hundred thousand dollars, payable as follows:

Ninety thousand dollars cash in hand, the receipt of which is hereby acknowledged; twenty-five thousand dollars secured by the note of said company, bearing even date herewith, and payable to the order of said Wilke on or before ninety days after date, with interest at six per cent per annum, guaranteed by Abner Taylor and "Lee & Ferguson;" and one hundred eighty-five thousand dollars secured by the note of said company, bearing even date herewith, payable to the order of said Wilke on or before one year after date, with interest at six per cent per annum, also guaranteed by said Abner Taylor and Lee & Ferguson, and to be further secured by the first-mortgage bonds of said party of the second part, to the amount of two hundred thousand dollars; and upon receipt of the notes and collateral above specified on or before fifteen days from this date, hereby agrees to cancel and surrender to party of the second part the certain contract made between the parties hereto, bearing date the twenty-fourth day of December, A. D. 1888, for the performance of certain work and other acts and things in said contract specified, and also sell, assign, transfer, and convey to party of the second part all the tools, plant (except dredge and equipment), machinery, material, boats, barges, and buildings, steam tug, and private residence of Mrs. Mary Wilke, as the same are owned and have been used by the said Wilke in prosecuting work under the contract aforesaid, and the same now being at the mouth of the Brazos River in the State of Texas, free from all liens and incumbrances whatever.

And party of the second part, in consideration of the covenants and agreements of party of the first part, hereby agrees simultaneously upon the cancellation and delivery of said agreement, and the conveyance to it of the property above mentioned, that it will transfer and deliver to the party of the first part the notes and securities above mentioned as the same are herein specified and set forth, and promptly within the time above limited.

And it is mutually agreed by and between the parties hereto that said party of the first part, at his election, may at any time within thirty days after the expiration of six months from this date, accept the two hundred thousand dollars of bonds in full payment and satisfaction of said note for one hundred and eighty-five thousand dollars; but if he so elects, he hereby agrees to surrender and deliver up said last-named note to the party of the second part within thirty days after the expiration of said six months, and upon failure of party of the second part to make such election and surrender said note within the time above limited, his right to accept said bonds in payment shall cease and determine. Said bonds for $200,000 are now in the hands of the American Loan and Trust Company of Boston, as trustees for party of the second part, which said bonds are to be held by said trust company for the benefit of said Wilke as security for the note aforesaid, and the said bonds are to become his property in case he elects to accept the same as hereinbefore set forth. And party of the second part hereby agrees that it will furnish to said Wilke, at the same time it delivers the notes and securities above mentioned to him, a certificate of said trust company that it holds said bonds for the benefit of Wilke and as collateral for the note of the party of the second part to said Wilke for one hundred and eighty-five thousand dollars; and that immediately upon notice of said Wilke's election to accept said bonds in payment of said note, or upon notice that default has been made in the payment of said note, it will transfer and deliver up said bonds to said Wilke on demand.

And it is further agreed that said one hundred and eighty-five thousand dollars note shall contain a power of sale of the bonds pledged as collateral by said Wilke or his assigns, and the form of the notes to be executed by party of the second part has been agreed upon by the parties hereto. Upon the surrender of said contract, dated

December 24th, 1888, the parties hereto shall be mutually absolved and released from any claims or liabilities thereunder, each to the other.

In witness whereof the said party of the first part has hereunto set his hand and seal in duplicate the day and year first above writteu, and the said the Brazos River Channel and Dock Company, of Brazoria County, Texas, has caused its corporate name to be hereunto signed in duplicate by its president, for that purpose duly authorized, and its corporate seal to be hereunto affixed by its secretary, the day and year first above written.

GUSTAV WILKE. [L. S.]
THE BRAZOS RIVER CHANNEL & DOCK CO.,
By W. M. D. LEE, *President.*

THOS. J. HURLEY, *Secretary.*
[SEAL.]

THE STATE OF TEXAS, *County of Brazoria:*

Know all men by these presents, that I, Gustav Wilke, have bargained, sold, and delivered, and do hereby bargain, sell, and deliver to the said the Brazos River Channel and Dock Company, its successors and assigns, the following described property, to wit: All the tools, plant (except dredge and its equipment), machinery, material, boats, barges, and buildings, steam tug and telegraph line, the same lately used by me in connection with the Brazos River improvement, all of said property being now in said county of Brazoria, said buildings being in the town of Quintana, and on the east side of the said Brazos River, in Velasco. Said telegraph line extends from Quintana to Columbia, in said Brazoria County, Texas. And it is intended hereby to include and embrace all property of the character above described now on hand, known as the property used by me in connection with said Brazos River improvement.

* * * * * * *

In witness whereof, I hereunto sign my name this 15th day of January, 1890.

GUSTAV WILKE.

APPENDIX I.

CHARTER OF BRAZOS RIVER CHANNEL AND DOCK COMPANY.

Be it known that the undersigned, Ira H. Evans, of Austin, Texas; Geo. W. Angle and Chas. W. Ogden, of San Antonio, Texas; and Wm. M. D. Lee, of Leavenworth, Kansas, hereby declare their intention of associating themselves together for the purpose of forming a private corporation under and in accordance with the laws of the State of Texas, for the uses and purposes hereinafter specified, and for that purpose agree to, subscribe, and present the following:

CHARTER OF THE BRAZOS RIVER CHANNEL AND DOCK COMPANY.

First. The name of the corporation shall be The Brazos River Channel and Dock Company.

Second. This corporation is formed for the purpose of constructing, owning, and operating a deep-water channel, from the waters of the Gulf of Mexico to the mainland at the mouth of the Brazos River, in the County of Brazoria, State of Texas, for the purpose of navigation and transportation, and for the construction, owning, and operating docks on the coasts of the Gulf of Mexico, at some convenient and safe place at or near the mouth of the said Brazos River, for the protection and accommodation of ships, boats, and all kinds of vessels for navigation, and their cargoes, and for the construction, maintenance, and operation of its said channel, with a depth of not less than ten (10) feet, and a width of not less than forty (40) feet, so far into the mainland, and between the banks of the said Brazos River, for its docks, that will afford security from cyclones, storms, and tidal waves; and for the construction, owning, and operating at such place or places on the banks of the said Brazos River, to which it may be necessary to construct, maintain, and operate said channel in order to afford security from such cyclones, storms, swells, and tidal waves, charging and collecting from the vessels using said docks, or from their masters, owners, or consignees, such sum or sums for the use of said docks, as may be authorized by the by-laws of this corporation, and agreed to by the masters, owners, or consignees of such vessels; and for the purpose of furnishing to vessels and boats adapted to the purpose facilities for navigating in and along the entire length of its said channel, charging and collecting such toll therefor as may be prescribed by the by-laws of this corporation, not to exceed one cent per barrel bulk of the capacity of each vessel for each mile of the length of its channel used by the vessel going either way; and for the purpose of constructing, owning, and maintaining a harbor

at or near the mouth of the said Brazos River, by building piers and breakwaters so far into the Gulf of Mexico as may be necessary to obtain sufficient depth of water to facilitate the ingress and egress, and the safety while in port of such vessels as may enter the same, to be done however, subject and in subordination of the Government of the United States, in as far as it may have constitutional power to control the same; and for the purpose of providing facilities to vessels and boats entering its harbor for anchorage, receiving and discharging cargoes and passengers, charging and collecting fair and reasonable tolls and wharfage therefor, to be prescribed by the by-laws of the corporation.

Third. The business of the corporation shall be transacted in Brazoria County, State of Texas.

Fourth. This corporation shall exist for the period of fifty years from the date hereof.

Fifth. The board of directors shall consist of seven (7) members, and the following are the names of the directors hereby appointed for the first year:

Ira H. Evans, Austin, Tex.
Jot Gunter, Dallas, Tex.
Geo. W. Angle, San Antonio, Tex.
Wm. M. D. Lee, Leavenworth, Kans.
John M. Ferguson, Leavenworth, Kans.
A. J. Tullock, Leavenworth, Kans.

Sixth. The capital stock of this corporation shall be one million ($1,000,000) dollars, to be divided into ten thousand (10,000) equal shares, of the par value of one hundred dollars ($100) each.

Witness our signatures at Austin, Texas, this 16th day of February, A. D. 1888.

IRA H. EVANS,
G. W. ANGLE,
CHAS. W. OGDEN,
WM. M. D. LEE.

STATE OF TEXAS, *County of Travis:*

Before me, A. B. Langemann, a notary public in and for Travis County, Tex., this day personally appeared Ira H. Evans, Geo. W. Angle, Chas. W. Ogden, and Wm. M. D. Lee, well known to me to be the persons whose names are subscribed to the foregoing instrument of writing, and acknowledged to me that they had signed and executed the same for the purposes and consideration therein expressed.

Witness my official signature and seal at Austin, Tex., this 16th day of February A. D. 1888.

[L. S.]

A. B. LANGEMANN,
Notary Public, Travis County, Tex.

(Indorsed:) Charter "The Brazos River Channel and Dock Company." Filed in department of state February 17th, A. D. 1888.

J. M. MOORE, *Secretary of State.*

THE STATE OF TEXAS, *Department of State.*

I, J. M. Moore, secretary of state of the State of Texas, do hereby certify that the foregoing is a true copy of the original charter of the Brazos River Channel and Dock Company, with the endorsements thereon as now appears of record in this department.

Witness my official signature and the seal of State affixed, at the city of Austin, this 29th day of February, A. D. 1888.

[L. S.]

J. M. MOORE, *Secretary of State.*

Now comes Wm. M. D. Lee, Ira H. Evans, Jot Gunter, Geo. W. Angle, John M. Ferguson, A. J. Tullock, and Charles W. Ogden, directors of "The Brazos River Channel and Dock Company," and hereby certify that at a meeting of the stockholders of the said Brazos River Channel and Dock Company held on the third day of November 1888, at the town of Brazoria, State of Texas, at which said meeting the entire capital stock of the company was represented by the holders thereof, the following resolution was carried by a unanimous vote of the stockholders:

"Be it resolved, That the capital stock of this corporation be increased to ($2,000,000.00) two million dollars, which shall be represented by twenty thousand (20,000) shares of the par value of ($100.00) one hundred dollars each, and be it further resolved that the board of directors be, and are hereby, instructed to certify this increase of the capital stock and to file the certificate of such increase with the secretary of state of the State of Texas in accordance with the provisions of article 576 of the Revised Statutes of the State of Texas."

Wherefore we, the said undersigned directors, hereby certify the date and amount of the said increase of the capital stock of the said Brazos River Channel and Dock Company, and pray that the same may be duly recorded as provided by law.

Witness our signatures at Brazoria, county of Brazoria, State of Texas, this 3rd day of November, A. D. 1888.

A. J. TULLOCK.
J. M. FERGUSON.
JOT GUNTER.
IRA H. EVANS.
W. M. D. LEE.
CHAS. W. OGDEN.
G. W. ANGLE.

THE STATE OF TEXAS, *County of Bexar:*

Before me, Sam. M. Johnson, a notary public in and for the county and State aforesaid, on this day personally appeared W. M. D. Lee, Charles W. Ogden, and George W. Angle, all known to me to be the persons whose names are signed to the foregoing instrument of writing, and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office at San Antonio, Bexar County, Tex., this 7th day of November, A. D. 1888.

SAM. M. JOHNSON,
Notary Public, Bexar County, Tex.

THE STATE OF KANSAS, *Leavenworth County:*

Be it remembered, that on this 19th day of November, A. D. 1888, before me, the undersigned, a notary public in and for the county and State aforesaid, came J. M. Ferguson and A. J. Tullock, who are personally known to me to be the same persons who executed the foregoing instrument of writing, and such persons duly acknowledged the execution of the same.

In witness whereof I have hereunto set my hand and affixed my notarial seal the day and year last above written.

(My commission expires November 11, 1891.)

[L. S.] CHARLES NEELY, *Notary Public.*

STATE OF TEXAS, *County of Dallas:*

Before me, E. H. Robertson, a notary public in and for the county and State aforesaid, on this day personally appeared Jot Gunter, known to me to be the person whose name is signed to the foregoing instrument of writing, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office at Dallas, Dallas County, Tex., on this 26th day of December, A. D. 1888.

[L. S.]

E. H. ROBERTSON,
Notary Public, Dallas County, Tex.

THE STATE OF TEXAS, *County of Travis:*

Before me, A. B. Langemann, a notary public in and for the county of Travis, in the State of Texas, on this day personally appeared Ira H. Evans, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office at Austin, Tex., this 27th day of December, A. D. 1888.

A. B. LANGEMANN,
Notary Public, Travis County, Tex.

(Endorsed:) Amendment to the Brazos River Channel and Dock Company. Filed in department of state January 29, A. D. 1889.

J. M. MOORE, *Secretary of State.*

THE STATE OF TEXAS, *Department of State.*

I, Geo. W. Smith, secretary of state of the State of Texas, do hereby certify that the foregoing is a true copy of the amended charter of the Brazos River Channel and Dock Company, with the endorsements thereon, as now appears of record in this department.

Witness my official signature and the seal of State affixed, at the city of Austin, this 30th day of November, A. D. 1894.

[L. S.] GEO. W. SMITH, *Secretary of State.*

THE STATE OF TEXAS, *County of Brazoria:*

I, E. D. Dorchester, secretary of the Brazos River Channel and Dock Company, do hereby certify that the above and foregoing copies of the charter and amendment to charter of the Brazos River Channel and Dock Company are true and correct copies of the said charter and amendment thereto.

E. D. DORCHESTER,
Secretary Brazos River Channel and Dock Company.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, the undersigned authority, on this day personally appeared E. D. Dorchester, secretary of the Brazos River Channel and Dock Company, personally known to me to be the person whose name is subscribed to the foregoing instrument as secretary of the said Brazos River Channel and Dock Company, who, after being by me duly sworn, on oath deposes and says that the above and foregoing copies of the charter and amendment to charter of the Brazos River Channel and Dock Company are true and correct copies of the said charter and amendment thereto.

E. D. DORCHESTER.

Subscribed and sworn to before me this 2d day of February, A. D. 1897.

[SEAL.]

THOS. E. DOUTHIT,
Notary Public, Brazoria County, Tex.

APPENDIX K.

AN ACT to incorporate the Texas Land and Immigration Company.

SECTION 1. *Be it enacted by the legislature of the State of Texas,* That T. B. Reynolds, Thomas Kearney, W. W. Phelps, and Ira H. Evans, and their associates, be, and they are hereby, incorporated and declared to be a body corporate and politic, under the name of the Texas Land and Immigration Company, and under such name may transfer their rights by succession, and shall be persons in law capable of suing and being sued, impleading and being impleaded, and that they and their successors, by the same name and style, shall be in law capable of holding and conveying any estate, real, personal, or mixed, and doing and performing all things necessary for the business of said company, and not contrary to the constitution and laws of this State. Said company shall have a corporate seal, with such device as they may select.

SEC. 2. That the objects of said company are declared to be to promote immigration to Texas, to facilitate the sale and purchase and the settlement of lands by immigration, and to introduce laborers, skilled operators, and capital into the State.

SEC. 3. That the capital stock of said company shall be one million of dollars, divided into shares of one hundred dollars each, and the said company may commence operations with all the powers and penalties of this act whenever fifty thousand dollars of the capital stock shall have been subscribed.

SEC. 4. That the management of the affairs of said company shall be conducted by a board of directors, and under such rules and regulations as the stockholders may determine at their first regular meeting; and the organization of said company and appointment of officers shall take place at such meeting.

SEC. 5. That the company may dissolve by a vote of two-thirds of the issued stock, in which event, after the payment of all outstanding obligations, the land and other possessions held by the company shall be sold at public auction, to be paid for in outstanding shares of the capital stock of the company until all such outstanding shares shall have been redeemed, and if not sooner dissolved its rights and franchises shall expire by limitation in thirty (30) years.

SEC. 6. That a majority of the board of directors of said company shall have power to pass all necessary regulations, ordinances, and by-laws for the regulation and government of said company in its business and contracts as are not in contravention of the constituion and laws of this State.

SEC. 7. That this act shall take effect and be in force from and after its passage.

Approved October 24th, 1871.

THE STATE OF TEXAS, *Department of State.*

I, Geo. W. Smith, secretary of state of the State of Texas, do hereby certify that the within and foregoing is a true copy of an act of the legislature of the State of Texas entitled as follows, with date of approval: "An act to incorporate the Texas Land and Immigration Company, approved October 24, 1871," the original enrolled bill of said act being now on file in this department.

Witness my official signature and the seal of State affixed at the city of Austin this the 22d day of June, A. D. 1891.

[SEAL.]

GEO. W. SMITH, *Secretary of State.*

I, E. D. Dorchester, secretary of the Texas Land and Immigration Company, do hereby certify that the above and foregoing is a true copy of the charter of the Texas Land and Immigration Company.

E. D. DORCHESTER,
Secretary Texas Land and Immigration Company.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, the undersigned authority, on this day personally appeared E. D. Dorchester, secretary of the Texas Land and Immigration Company, personally known to me to be the person whose name is subscribed to the foregoing instrument as said secretary of the said Texas Land and Immigration Company, who, after being by me duly sworn, on oath deposes and says that the above and foregoing copy of the charter of the Texas Land and Immigration Company is a true and correct copy of such charter, and that he signed the above certificate as secretary of said Texas Land and Immigration Company.

E. D. DORCHESTER.

Sworn to and subscribed before me this 2d day of February, A. D. 1897.

[SEAL.]

THOS. E. DOUTHIT,
Notary Public Brazoria County, Tex.

APPENDIX L.

CHARTER OF THE VELASCO TERMINAL RAILWAY COMPANY.

Be it known that we, the undersigned, Abner Taylor, W. M. D. Lee, J. M. Ferguson, E. J. Wilson, Gustav Wilke, G. W. Angle, F. W. Vaughn, W. W. Anderson, L. E. Deger, and Frank Caldwell, subscribers in good faith to the capital stock of the contemplated railway herein named, do hereby, in accordance with the laws of the State of Texas, adopt and subscribe the following articles of incorporation:

ARTICLE I.

The name of the corporation shall be "The Velasco Terminal Railway Company."

ARTICLE II.

This corporation is formed for the purpose of constructing, equipping, owning, and operating a railroad with all necessary side tracks, switches, turn-outs, turntables, etc., with suitable telegraph lines from a point in the county of Brazoria, Texas, on the east bank of the Brazos River, in Velasco, about three or three and a half miles above the mouth of said river, through the county of Brazoria and into the county of Fort Bend, Texas, to Arcola Junction, in all making about forty miles of railway.

ARTICLE III.

The principal office of this corporation shall be established and maintained in Velasco, Brazoria County, Texas, situated about three or three and a half miles above the mouth of the Brazos River.

ARTICLE IV.

The existence of this corporation shall date from the filing of the articles of incorporation in the office of the secretary of state for the State of Texas, and shall exist for the period of fifty years from that date, with right of renewal, as provided by law.

ARTICLE V.

The amount of the capital stock of this corporation shall be ($600,000) six hundred thousand dollars.

ARTICLE VI.

The places of residence of the several subscribers hereto are as follows: Abner Taylor, Chicago, Illinois; W. M. D. Lee, Leavenworth, Kansas; J. M. Ferguson, Leavenworth, Kansas; E. J. Wilson, Brazoria, Texas; Gustav Wilke, Chicago, Illinois; G. W. Angle, San Antonio, Texas; F. W. Vaughn, Velasco, Texas; W. W. Anderson, Chicago, Illinois; L. E. Deger, Velasco, Texas; Frank Caldwell, Velasco, Texas.

ARTICLE VII.

The corporation hereby created, and its successors, shall be forever subject to all the changes, rules, and regulations that may be prescribed by the laws of Texas.

ARTICLE VIII.

The board of directors of this corporation shall consist of seven members, and E. J. Wilson, G. W. Angle, Gustav Wilke, Frank Caldwell, Abner Taylor, Lewis R. Bryan, a resident citizen of Brazoria County, Texas, and E. S. Dreyer, of Chicago, Illinois, all of whom are subscribers to stock in said company, shall be members and constitute the first board of directors of said corporation; and the government of this corporation and the management of its affairs shall be vested in the board of directors, provided that the said board of directors may, whenever it shall be deemed best, elect from their number an executive committee of three members of whom the president of said board of directors shall be one, in which said committee shall be vested the government of this corporation and the management of its affairs during the intervals between the meetings of the board of directors.

ARTICLE IX.

The capital stock of this corporation shall be divided into (6,000) six thousand shares of the par value of ($100) one hundred dollars each.

ABNER TAYLOR.
W. M. D. LEE.
J. M. FERGUSON.
E. J. WILSON.
GUSTAV WILKE.
G. W. ANGLE.
F. W. VAUGHAN.
W. W. ANDERSON.
L. E. DEGER.
FRANK CALDWELL.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, S. M. Jack, justice of the peace and ex officio a notary public in and for the county and State aforesaid, on this day personally appeared Abner Taylor, W. M. D. Lee, J. M. Ferguson, E. J. Wilson, Gustav Wilke, G. W. Angle, F. W. Vaughan, W. W. Anderson, L. E. Deger, and Frank Caldwell, each and all known to me to be the persons whose names are signed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and considerations therein expressed.

Given under my hand and seal of office at Quintana this 27th day of July, A. D. 1891.

S. M. JACK,
Justice of the Peace and ex officio Notary Public, Brazoria County, Tex.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, the undersigned authority, personally appeared Abner Taylor, Gustav Wilke, and G. W. Angle, who, after being by me duly sworn, on oath depose and say that an amount of the capital stock of the Velasco Terminal Railway Company equal to one thousand dollars ($1,000) for every mile of railway embraced in and authorized by the charter or articles of incorporation of said company has been in good faith subscribed, and that (5) five per centum of said amount so subscribed has been actually paid to the directors of said company.

ABNER TAYLOR.
GUSTAV WILKE.
G. W. ANGLE.

Subscribed and sworn to before me this 27th day of July, A. D. 1891.

S. M. JACK,
Justice of the Peace, Brazoria County, Tex.

AUSTIN, *July 29, 1891.*

I hereby certify that I have carefully examined the articles of incorporation of the Velasco Terminal Railway Company and find the same to be in accordance with title 84, Chapter I, of the Revised Statutes, and the act approved April 8, 1889, amendatory thereof, and not in conflict with the laws of the United States or of this State.

[SEAL.] C. A. CULBERSON, *Attorney-General.*

STATE OF TEXAS, *Department of State.*

I, George W. Smith, secretary of state of the State of Texas, do hereby certify that the foregoing original charter of the Velasco Terminal Railway Company was filed for record in this department July 29, 1891, and the same, with endorsements thereon, is now of record on pages 34 to 36, Book D, of railroad charters.

Witness my official signature and the seal of State affixed at the city of Austin this 30th day of July A. D. 1891.

[SEAL.] GEO. W. SMITH, *Secretary of State.*

AMENDMENT OF THE ARTICLES OF INCORPORATION OF THE VELASCO TERMINAL RAILWAY COMPANY.

Be it known that in accordance with the provisions of the laws of the State of Texas authorizing any railroad corporation heretofore organized and now existing by virtue of articles of incorporation heretofore filed in the office of the secretary of state of the State of Texas, duly certified as examined and approved by the attorney-general of said State, does hereby and by these presents and by this amendment in writing, signed by the president and board of directors of said corporation, amend its articles or act of incorporation so as to add thereto the following clause or section, to wit:

It is the purpose and intention of this corporation to construct, own, maintain and operate a branch line of railway from its main line at Angleton, in Brazoria County, Texas, to Alvin, in Brazoria County, Texas, a distance of about 21 miles.

The object of this amendment to charter of said Velasco Terminal Railway Company is to project and provide for the locating, constructing, owning, maintaining and operating a branch line from its said main line at Angleton to said town of Alvin, in Brazoria County. Said line will run in a northeasterly direction from said station known as Angleton to said town of Alvin, and it is not the purpose of this amendment to change the charter of this corporation in any other manner than by adding thereto the clause or section above set forth in this amendment.

It is also the purpose of this corporation to construct, own, and operate such necessary telegraph lines along the line of railway of this company constructed or to be constructed as may be necessary for the business and purposes of this corporation.

In witness whereof the said corporation, the Velasco Terminal Railway Company, has caused this writing to be signed by its president and board of directors of this corporation, and attested by its secretary under the seal of said corporation, this nineteenth of June, A. D. 1893.

C. B. FARWELL, *President.*
ABNER TAYLOR, *Director.*
W. M. D. LEE, *Director.*
G. W. ANGLE, *Director.*
EUGENE J. WILSON, *Director.*
F. CALDWELL, *Director.*
[SEAL.] LEWIS R. BRYAN, *Secretary and Director.*

STATE OF ILLINOIS, *County of Cook:*

Before me, Charles F. Harding, a notary public in and for county of Cook, in the State of Illinois, on this day personally appeared C. B. Farwell, the president of the Velasco Terminal Railway Company, known to me to be the person whose name is subscribed to the foregoing instrument; and acknowledged to me that he executed the same for the purposes and consideration therein expressed for and in behalf of the Velasco Terminal Railway Company; and said C. B. Farwell, as such president of said company, acknowledged such instrument to be the act and deed of the said corporation, the Velasco Terminal Railway Company, and he further acknowledged said instrument to be an amendment to the articles of incorporation of the said Velasco Terminal Railway Company, and that he signed same as president of said corporation.

Given under my hand and seal of office this nineteenth day of June, A. D. 1893.

[SEAL.] CHARLES F. HARDING, *Notary Public.*

STATE OF ILLINOIS, *County of Cook:*

Before me, Charles F. Harding, a notary public within and for the county of Cook, in the State of Illinois, personally appeared Abner Taylor, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and considerations therein expressed, and further acknowledged said instrument to be an amendment to the articles of incorporation of the Valasco Terminal Railway Company, and that he signed the same as such as a member of the board of directors of said company.

Given under my hand and seal of office this 19th day of June, A. D. 1893.

[SEAL.] CHARLES F. HARDING, *Notary Public.*

THE STATE OF TEXAS, *County of Brazoria:*

Before me, F. W. Vaughan, a notary public within and for the county of Brazoria, in the State of Texas, personally appeared W. M. D. Lee, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to

me that he executed the same for the purposes and consideration therein expressed, and further acknowledged said instrument to be an amendment to the articles of incorporation of the Velasco Terminal Railway Company, and that he signed the same as such a member of the board of directors of said company.

Given under my hand and seal of office this 23d day of June, A. D. 1893.

F. W. VAUGHAN,
Notary Public, Brazoria County, Tex.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, F. W. Vaughan, a notary public within and for the county of Brazoria, in the State aforesaid, personally appeared Eugene J. Wilson, F. Caldwell, G. W. Angle, and Lewis R. Bryan, known to me to be the persons whose names are subscribed to the foregoing instrument, and also known to me to be resident citizens of the State of Texas, and severally acknowledged to me that they executed the same for the purposes and consideration therein expressed, and further acknowledged said instrument to be an amendment to the articles of incorporation of the Velasco Terminal Railway Company, and that they severally signed the same as such as members of the board of directors of said company.

Given under my hand and seal of office this 23d day of June, A. D. 1893.

[SEAL.]

F. W. VAUGHAN,
Notary Public, Brazoria County, Tex.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, F. W. Vaughan, a notary public in and for the county of Brazoria and State of Texas, on this day personally appeared Lewis R. Bryan, the secretary of the Velasco Terminal Railway Company, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed for and in behalf of the Velasco Terminal Railway Company, and said Lewis R. Bryan, as such secretary of said company, acknowledged such instrument to be the act and deed of said corporation, the Velasco Terminal Railway Company, and he further acknowledged said instrument to be an amendment to the articles of incorporation of the said Velasco Terminal Railway Company, and that he signed same as secretary of said company.

Given under my hand this 23d day of June, A. D. 1893.

[SEAL.]

F. W. VAUGHAN,
Notary Public, Brazoria County, Tex.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, the undersigned authority, personally appeared Lewis R. Bryan, F. Caldwell, W. M. D. Lee, directors of Velasco Terminal Railway, who, after being by me duly sworn, on oath depose and say, that an amount of the capital stock of the Velasco Terminal Railway Company equal to one thousand dollars ($1,000) for every mile of railway embraced in and authorized by the charter and amendment thereto or articles of incorporation of said company has been in good faith subscribed, and that (5) five per centum of said amount so subscribed has been actually paid to the directors of said company.

LEWIS R. BRYAN.
F. CALDWELL.
W. M. D. LEE.

Subscribed and sworn to before me this 26th day of June, A. D. 1893.

[SEAL.]

F. W. VAUGHAN,
Notary Public, Brazoria County, Tex.

ATTORNEY-GENERAL'S OFFICE,
Austin, June 24, 1893.

I hereby certify that I have carefully examined the amendment to the articles of incorporation of the Velasco Terminal Railway Company, and find the same to be in accordance with the provisions of chapter 2, title 84, of the revised statutes of Texas as amended by chapter 105 of the general laws of 1891, and not in conflict with the laws of the United States or of this State.

It is not intended by the foregoing approval of the amendment to the charter of this company to authorize it to construct a telegraph line and charge tolls thereon, but said telegraph line is limited strictly to the purposes of the railway company itself.

Nor is said approval intended to dispense with the affidavit required by article 4103 of the Revised Statutes, which ought to be complied with before said articles are filed.

C. A. CULBERSON, *Attorney-General.*

STATE OF TEXAS, *Department of State.*

I, Geo. W. Smith, secretary of state of the State of Texas, do hereby certify that the foregoing amendment to charter of the Velasco Terminal Railway Company was filed for record in this department on June 26th, A. D. 1893, and the same, with endorsements thereon, is now of record on pages 368 to 371, Book D of railroad charters.

Witness my official signature and the seal of State affixed, at the city of Austin this 27th day of June, A. D. 1893.

[SEAL.] GEO. W. SMITH, *Secretary of State.*

I, E. D. Dorchester, do hereby certify that I am secretary of the Velasco Terminal Railway Company, and that the above and foregoing copies of the charter of the said Velasco Terminal Railway Company and of amendment to said charter are true and correct copies of said charter and amendment.

E. D. DORCHESTER,
Secretary Velasco Terminal Railway Company.

THE STATE OF TEXAS, *County of Brazoria:*

Before me, the undersigned authority, on this day personally appeared E. D. Dorchester, secretary of the Velasco Terminal Railway Company, personally known to me to be the person whose name is subscribed to the foregoing instrument as secretary of said Velasco Terminal Railway Company, who after being by me duly sworn on oath deposes and says that the above and foregoing copies of the charter of the Velasco Terminal Railway Company and of amendment thereto are true and correct copies of the said instruments.

E. D. DORCHESTER.

Subscribed and sworn to before me this second day of February, A. D. 1897.

[SEAL.] THOS. E. DOUTHIT,
Notary Public, Brazoria County, Tex.

APPENDIX M.

LETTER OF MR. A. BOSCHKE, GENERAL MANAGER OF THE TEXAS COAST CANAL COMPANY.

SAN ANTONIO, TEX., *January 1, 1897.*

GENTLEMEN: I have the honor to send you inclosed an address to the members of the Velasco syndicate in which I point out a number of advantages which the harbor will give to commerce and benefits to the public at large. I also point out that if the coast canal between the Sabine Harbor and the Rio Grande is constructed it will make Matagorda Bay a tidal reservoir to maintain the depth of 25 feet at the entrance of the Brazos River by the tidal scour reenforcing the river flow.

I hope you may find in the inclosed address useful information.

Most respectfully, yours,

A. BOSCHKE.

The Hon. Messrs. ROBERT, MOORE, and FORNEY,
United States Commissioners on Velasco Harbor, Velasco, Tex.

ADDRESS OF MR. A. BOSCHKE, GENERAL MANAGER OF THE TEXAS COAST CANAL COMPANY, TO THE BOARD OF DIRECTORS OF THE BRAZOS RIVER CHANNEL AND DOCK COMPANY.

To the President and Board of Directors of the Brazos River Channel and Dock Company, Velasco, Tex.:

The Texas Coast Canal Company, duly incorporated under the laws of the State of Texas, is about to establish inland navigation for stern-wheel steamers to ply between the Rio Grande and Brazos rivers, moving freight by means of barges in tow at very low freight charges. This will result in furnishing an important traffic of which your harbor will be the terminal for shipment, and the city of Velasco will become the distributing point for the supply in the near future for a large and thriving farming population and numerous towns now existing and necessarily increasing in number. The Texas Coast Canal Company proposes to begin this work by constructing a canal from the Brazos River, at or near Quintana, and cut a channel 120 feet wide on the bottom, with proper slopes, and 6 feet deep at low water to Matagorda Bay, intersecting the San Bernard and the Caney rivers at points where they

are navigable, thereby insuring at an early day traffic to your harbor and giving transportation to the productions of the soil and timber at a low rate of freight to a large scope of country already under cultivation, but much impeded for further development by want of transportation facilities.

The work thence will be continued by removing by means of dredging such reefs, bars, and shallow places to give a like depth and width of channel as above stated for the entire distance to the Rio Grande, resulting in like benefits to all the lands bordering on the connecting lagunas and bays and their navigable tributary rivers, amounting to an estimated average of about four and one-half millions of acres.

The magnitude of the results of this enterprise can hardly be overestimated, as it will make it possible to bring under cultivation millions of acres of the most fertile lands, favored by an ideal climate and, to a great extent, having a subirrigated soil, which insures crops independent of the seasons of rainfall, to grow abundant high-priced productions of the farm, orchard, and vineyard, when cheap and rapid transportation is provided for these manifold and abundant crops to the best markets at home or abroad.

The productive value of the coast lands is not generally known, but has been demonstrated by several settlements between the Rio Grande and Brazos rivers, where sea-island cotton, all plants for textile fabrics now successfully grown in Florida, sugar cane, a superior quality of Habana tobacco, all varieties of fruits, the grape, early and late vegetables are growing to perfection, and are all high-priced productions, which, when cheap and quick transportation is afforded to the millions of acres, they will develop new wealth from which you will reap great benefits.

The immense areas of lagunas and bays between the Rio Grande and the Brazos rivers, teeming with food-fish and unequaled anywhere in extent of delicious oyster beds, will become accessible by means of the coast canal by quick and cheap transportation to Velasco, and make it the greatest fish and oyster market in the United States.

The benefits your city and harbor will receive from the development of these new resources of wealth will be in proportion to the fostering care of the enterprise you may give us.

The early realization of the foregoing can only be obtained by a carefully matured plan upon sound business and financial operations; and, as you are a vitally interested party, I ask your cooperation and advice in maturing the same to a successful end.

In a careful review of the entire field of this enterprise there are a number of elements bearing upon its successful accomplishment, which I respectfully present to you for consideration.

The proposition to accomplish inland navigation from the Mississippi to the Rio Grande has been a subject of consideration of many farseeing minds and of our National Government, which had this measure investigated in 1873 by an elaborate survey to determine its practicability and its cost, and its bearing on the commercial development of the country, and its advantage as a strategic measure to move troops and supplies in case of war, without the expensive protection of the Navy upon the Gulf.

This measure of such great national and commercial importance has been delayed for the following reasons:

No special efforts were made by individuals or corporations because the time had not yet arrived in the development of the coast country when urgent necessity demanded action, and the results of the investigation of the National Government, although showing its practicability, it also showed its disproportional expenditure required to a yet undeveloped country and commerce, or of war measures. Since then, up to date, four important factors have evolved, which have overcome the difficulties in the way and demand the immediate undertaking of this work.

First. Progress, by mechanical ingenuity to improve machinery by which the cost of the excavation of material to construct the canal or channels has been reduced to one-twelfth of the estimates of the cost by the United States engineers—that is, from 60 cents to 5 cents per cubic yard, and the tenth length of time required to accomplish the construction.

Second. The coast lands were occupied and cultivated by few people, producing not sufficient traffic to demand a thorough water transportation organization. This condition has undergone a wonderful change. The march of emigration has set southward and the necessity has arisen to provide in advance for the facilities of transportation for the coming population, and in consequence the holders of large estates are now ready and willing to sell their lands in subdivisions who, ten years ago, would have refused to sell.

Third. By the natural law of development, railroads have opened access to the coast, and by foresight of private enterprise and the assistance of our National Government, harbor facilities have been provided to enable the present and coming producer of wealth to send it to the best market at home or abroad.

Fourth. Up until now there has nobody come forward willing and competent to undertake the task to organize such an enterprise and push it to a successful end, which, however, the Texas Coast Canal Company *has*, *can*, and *will* do now with your assistance, for these reasons: The three promoters have carefully digested the plan, and met all legal requirements of organization, and hold the capital stock virtually unimpaired, and are ready and willing to transfer its management to those who are vitally interested to see this meritorious enterprise started and will furnish the least amount of money necessary to successfully inaugurate the work and to bring it to a stage where it has a visible and tangible existence and is not a problem *talked* about: when we are confident that ample capital can be secured at home or abroad to bring the work to a successful end by wise and economical administration. As cautious business men we must review all the phases bearing on the enterprise.

First. The practicability, from an engineering point, has been carefully studied by me, and, as above stated, is indorsed after surveys, estimates, and report of the United States Engineer Department. However, the execution of such work is in a great measure depending on its success upon the knowledge, experience of like works, and administrative ability of the person in charge and the application and use of effective machinery. As the work at present has been intrusted to me, as general manager, I am unavoidably compelled to speak of myself.

Fitted by education and serving under such distinguished officers, in the capacity of United States assistant engineer, as General Totten and General Humphreys, both Chief of Engineers of the United States Army; Professor Bache, superintendent of the United States Coast Survey; General Foster, General Alexander, Colonel Mendell, Colonel Stuart, Captain Payson, and Major Heuer, all of the United States Engineer Corps, I have been employed under their orders in the improvement of New York Harbor, Boston Harbor, and numerous smaller harbors on the Atlantic Coast; San Francisco Harbor, Sacramento and San Joaquin rivers, San Pedro and Humboldt Bar Harbor on the Pacific Coast. I gained, in the course of forty years' service, much varied and valuable experience, and I believe that I am especially fitted to conduct the work in hand judiciously and economically, more so for the reason that I had a chance to use all types of dredges and aided in perfecting them. I am now prepared to excavate, with such improved machinery, the proposed canal at the minimum rate of about 400 cubic yards per hour, for twenty-two hours out of twenty-four, or a total output of 8,800 cubic yards per day, which reduces the cost to 5 cents per cubic yard and time required, including usual delays, to 2 miles a month. The material thus excavated from a canal 120 feet wide and 6 feet at low water will be deposited at a safe distance from the edge of the canal. In this instance of the cut between the Brazos and the Matagorda Bay on the Gulf side, which will build up a levee 150 feet base, 30 feet top, and 10 feet high, which, when planted with salt-water cedar, will make a permanent barrier against any encroachment of the Gulf. Similar constructions, adaptable to locality, will be employed to protect the canals or channels along the entire line to insure a permanency of the work and the least expense of maintenance.

Reverting to the importance of this canal between the Brazos and Matagorda Bay, I desire to point out its value to your corporation before going further in the discussion of the enterprise as a whole.

First. This cut as a feeder of traffic to the commerce of your harbor and to build up Velasco to a business city of importance, I have already before mentioned.

Second. It has, however, a far greater value to you. It will serve to connect your harbor works with one of the greatest tidal reservoirs, from the tidal flow of which will be insured the maintenance of a permanent depth on the bar. In order to show to you the correctness of this important statement, I will point out the existing physical conditions operating to that end. At the low water and ordinary stage of the Brazos River when the flood tide of the Gulf enters its mouth, it will have the canal as a reservoir to fill until it meets its equilibrium from Matagorda Bay. At ebb tide the outflow will be largely augmented during the times when the southwest winds drive the waters of Matagorda Bay toward and into the canal, besides being reenforced by the discharge of the waters of the San Bernard and Caney rivers, causing a strong current toward the Brazos, increasing largely the outflow between the jetties, causing an effective scour to maintain a permanent depth which this new regimen will establish. These conditions are further favored by the configuration of the shores at the head of Matagorda Bay, which is funnel shaped and in which the canal is the apex, which in times of the greater part of the year the prevailing southwesterly winds will raise the level of the Matagorda Bay appreciably at the mouth of the canal and add greatly to the discharge of its tide waters by a strong current through the canal, and thence over the bar of your harbor.

Third. The canal between the Brazos and Matagorda Bay will be, in addition to the above, of great value to you, as it will serve as a drainage canal to all the land owned by your corporation adjacent to it and enhance its value many fold, making it fit for farming lands.

Fourth. Before leaving the subject of stating the benefits you will derive from the coast canal, I have a suggestion to make. In case affairs can be so arranged that this work is immediately undertaken, I will build a dredge without delay and can have it completed in ninety or one hundred days, and you can avail yourself of it to deepen your bar to 25 feet and any width you may desire by paying for adding such machinery and appliances that would not be needed for the mere purpose to dig the canal, but when procured would enable the dredge to work at the bar and dig to 20 or 25 feet in depth and deliver the excavated material behind the jetties, which would greatly increase their usefulness. When you see the plans for the dredge you will readily understand the adaptability of it for this work. You would in that case have the further advantage to call the dredge to your aid in a few hours' notice, when working at the canal excavation, if by some unfavorable conditions any part of the bar channel should shoal and not have the required depth, but which could be restored at a small expense and in a short time. When the canal is completed and the dredge further removed the tidal action above mentioned will dispense with its use.

Furthermore, it is a necessary part of your final harbor improvement to make a cut-off of the bend in the Brazos River above Quintana, which the dredge, with the additional appliances of centrifugal pump and pipe line, would be prepared to do at the low price of 8 cents per cubic yard.

Returning to the consideration and discussions of the coast canal, when the connection between Brazos River and Matagorda Bay is made there remains only one small obstruction, "Dog Island Reef," to be cut through, when the whole of Matagorda Bay shores are accessible to steamer landings, of which there are thirty-four places which require none or very little dredging.

Up to this stage there are positive results to be reaped on a large and increasing traffic for your harbor and the city of Velasco, even if we had for a time to stop right there with the enterprise. However, if we achieve that much we will have the assistance of the world's money market to supply the funds to carry this work to completion from the Rio Grande to the Mississippi, as its great value to the development of the country will have been demonstrated.

I desire to point out to you one great chance which the coast canal will afford you which has possibilities that are limitless in its development. When the canal has made its connection with the Rio Grande, we will find by that time the railroad surely completed from Matamoras along the Rio Grande to Tampico, which opens up to the canal the supplies of the cheapest obtainable coal from the Sabine mines of Mexico, besides other valuable products that barges can bring for $1 per ton from the Rio Grande, where the canal and railroad meet, to Velasco, which can and will make that city a second Lowell or Manchester, according to the energy of its citizens, because it will have all the elements required, viz, raw material at its very door, cheap coal, a harbor to ship the manufactured products to all nations, at Houston a railroad center reaching to all points of consumption on this continent, and to ship by through bills of lading either way productions and supplies at the lowest rates into Mexico and to all the coast towns. For the solution of the financial problem there is only one possible way of procuring the money to carry out this meritorious enterprise—by availing ourselves of the willingness of the landowners to donate some of their land to the Texas Coast Canal Company in aid of the construction of the canal, and by doing so thereby benefit themselves manifold for what they give, because they gain two advantages. One class that wants to sell their land can do so at surely double its present value by reason of the canal making the land accessible to ship its products; the other class of landowners that wish to stay have not only the enhanced value of their land, but reap the annual benefits of sending their products at the cheap water rates to the best market. Therefore the incentive is there from all owners of the coast land, from the Rio Grande to the Brazos, to contribute land donation, and I would have by this time already a sufficient land subscription if I was not handicapped by the peculiar conditions existing in southwest Texas—that so many abortive enterprises have made the citizens cautious to lend their aid before the enterprise takes a visible shape and has a sound financial backing. The people can not be blamed for this, and it is therefore the province of a strong corporation to take this matter in hand, and the above aid of land donations will come freely and liberally with the confidence thereby insured.

A conservative estimate of the land donation is 200,000 acres, which when sold to settlers at an average low estimate of $15 per acre is $3,000,000.

The 300,000 shares of the Texas Coast Canal Company will consequently not have to go begging for purchasers.

The estimate of cost of the work is $800,000, including construction and administrative expenditure, and in fact the contract of the canal being already made with the Texas Dredging Company to do the dredging of the canal for an average price of $5,500 per mile; the canal company furnishes the dredges and equipments and the

dredging company pays all operating expenses, and keeps the dredges in p repair.

By virtue of the rights and privileges under the laws of the State of Tex Texas Coast Canal Company can levy toll from all vessels passing either through all sections of the canal constructed by them at the rate of 1 cent p rel bulk per mile, which you will readily see will be a revenue which, if dem would give an income to make the dividends upon the company's stock one largest of this class of investments.

However, the value of the stock will be unquestionably great from the di resulting from the sale of the company's lands, when such lands are sold to settlers, and from the sure and ever-increasing revenues of toll which a wise m ment will so regulate to foster the traffic and still give us a large dividend.

In regard to insure the shippers of the lowest freight rates, we have left the portation to competing steamboat companies.

I will use all my experience and judgment in the first location and construc the canal that its maintenance will be a minimum, in fact, for years none for the whole of the distance.

In review of the financial situation above discussed, it results in this: If your poration will take such action to inspire confidence to the landowners *that the will be done*, then the land donations will be insured and will give the necessary edge to our certificates of stock to make them salable at any money marke must leave to your superior judgment to act in this matter to the best interes us all concerned in this great enterprise.

Very respectfully, yours,

A. BOSCHKE,
Director and General Manager of the Texas Coast Canal Company,
342 Crockett street, San Antonio, Te.

The National Bank of Velasco is the financial agent for the sale of stock of Texas Coast Canal Company.

APPENDIX N.

LETTER OF MR. GUY M. BRYAN.

QUINTANA, *January 23, 187*

DEAR SIR: In compliance with your request, I present you with the follow statements for your information in regard to the ownership of the frontage on the Brazos River:

The company engaged in obtaining deep water at the mouth of Brazos R own all the frontage below Velasco, on both sides of the river, down to Quintana town of Quintana owns 2,331 feet. This frontage of the town has been in *litig* with the company, but by recent decree of the district court of Texas has been awarded to the town, and the company consents to the award and will not appe Mr. J. P. Bryan, at my instance, has furnished me with the inclosed statement ownership of frontage on the river above the town of Velasco. I hope this inform tion covers all you desire.

Very truly, yours, etc.,

GUY M. BRYAN.

Col. H. M. ROBERT, *Chairman, etc.*

STATEMENT MADE TO MR. GUY M. BRYAN, SR., BY MR. J. P. BRYAN.

The E. M. Williams labor, 1 mile above Velasco on west side of the Brazos River owned by Hiram L. Brown; 700 varas frontage.

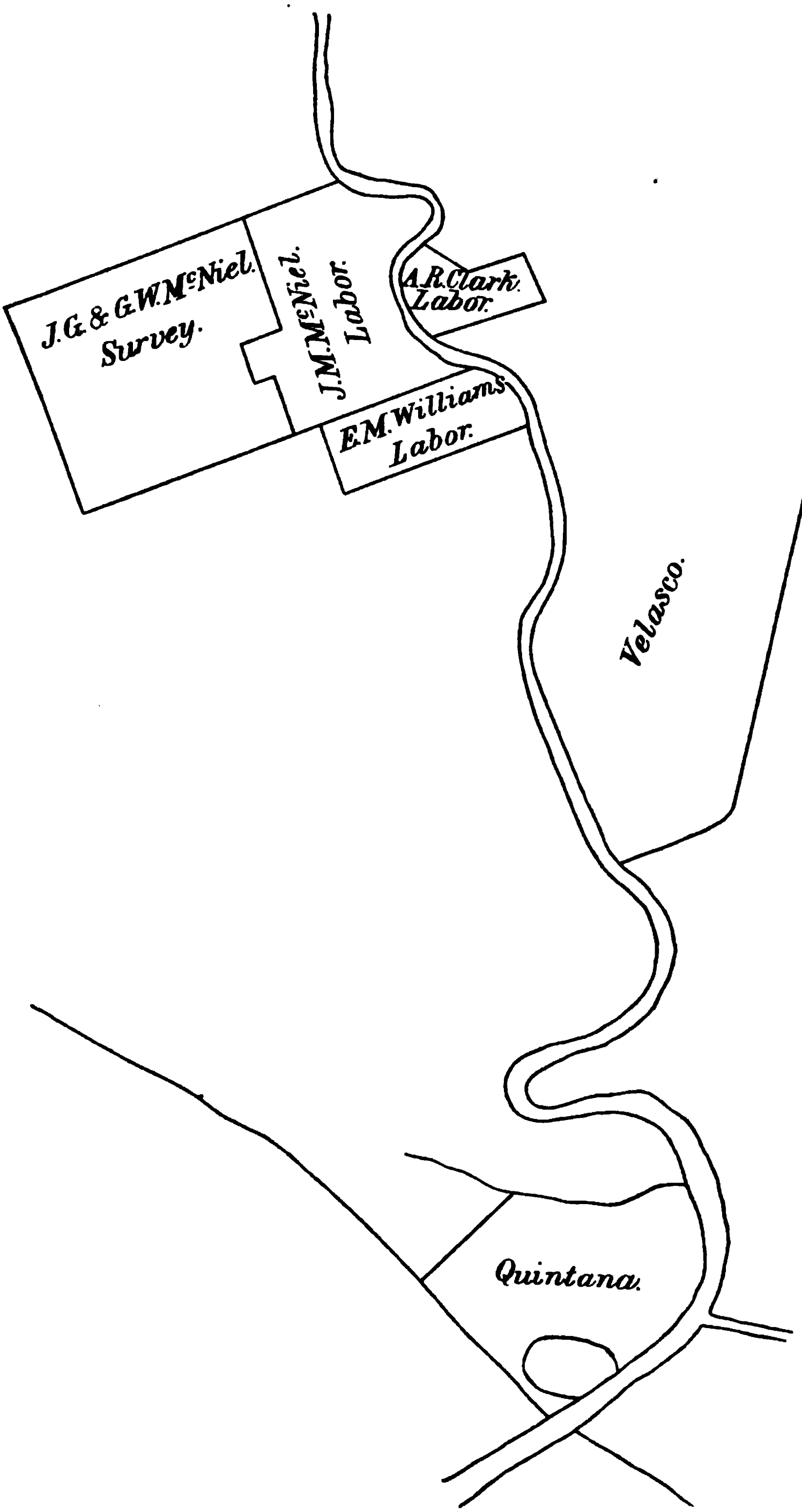
J. M. McNiel labor, on west side of the Brazos River about 2 miles above Velasco owned by private parties; 700 varas frontage.

J. G. and G. W. McNiel survey on west side of the Brazos River, a little over miles above Velasco, has several thousand feet front on river, and is owned by private parties.

Above and adjoining the J. G. McNiel, one-half league on west side of the Brazos River there are several miles of river front owned by private parties.

On the east side of the Brazos River, 2 miles above Velasco, the front of the A. B. Clark labor is owned by private parties; 700 varas frontage.

BRAZOS RIVER, TEXAS.



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APPENDIX O.

LETTER OF SECRETARY OF WACO COMMERCIAL CLUB.

WACO COMMERCIAL CLUB,
Waco, Tex., January 28, 1897.

DEAR SIR: The visit of your board to Velasco and the importance of your forthcoming report to Congress upon the improvements at the mouth of the Brazos have been brought to the attention of the Waco Commercial Club, and I am directed to forward to you all data obtainable concerning the navigation of the Brazos. The success of the promoters of the deep-water port at the mouth of the river has intensified the interest felt in the matter of securing Government aid in the opening of the river to navigation as far up as Waco, a distance of perhaps 500 miles by the meanderings of the stream, and I beg to submit a few figures relative to the volume of commerce which would be effected by such navigation: The Brazos River traverses twelve counties from Waco to its mouth, namely: McLennan, Falls, Milam, Robertson, Brazos, Burleson, Grimes, Washington, Waller, Austin, Fort Bend, and Brazoria. Each of these counties contains large bodies or rich bottom lands along the Brazos and tributaries constituting the Brazos Valley, the finest cotton producing region in the world.

I have not reliable reports of the exports of cotton from the counties named later than 1894, which place it at 420,000 bales, in round numbers. I am sure a half million bales is not an exaggerated estimate of the amount for an ordinarily good crop year in future, with a probable increase with better and cheaper transportation facilities. The Brazos Valley now produces about one-sixth of all the cotton raised in Texas, and with navigation of the river to Waco it would certainly produce one-fifth of the Texas crop. Along with the long-staple cotton must be considered the item of cotton seed. For every bale of cotton produced there is a yield of a half ton of seed, so the production of cotton seed in the Brazos Valley was in 1894 about 210,000 tons, and with the estimated increase in cotton production would reach 250,000 tons.

According to the report of the Texas agricultural bureau for 1894, the twelve counties named lying between Waco and Velasco produced more than half the entire sugar crop of Texas, valued at $660,000, besides molasses valued at $40,000, and sorghum valued at $50,000. We have, then, cotton, 500,000 bales, worth $17,500,000; 250,000 tons of cotton seed, worth $1,750,000; and sugar-cane products worth $750,000, making a total of $20,000,000 in these three items alone. When we take into consideration the other farm products, live stock, etc., which would in all probability add as much more to the export traffic, we have $40,000,000 of exports which would be accommodated by the navigation of the Brazos. The imports are not taken into account, but would of course enter into the traffic and would probably equal the exports.

I now desire to direct your attention to the feasibility of Brazos navigation. The Waco Board of Trade in 1890 secured the services of Prof. J. H. Hurwood, of Waco, to survey the Brazos River from Waco to Richmond in Fort Bend County. Professor Hurwood traversed the river in a small boat, making measurements and collecting data covering every detail bearing upon navigation, and his report is the completest and most reliable collection of important information on the subject now extant. I submit extracts from the same. Addressing the board of trade he says:

"The subjects for observation in your instructions were ten in number. I report on them seriatim, but not in the order in the copy. I have inverted them because by this method I can give a more comprehensive view of the subject.

"No. 10. Instruction number ten is as follows:

"'Ascertain the approximate distance from Waco, by river, to Richmond.'

"Answer. The approximate distance between the two points is 416 miles.

"No. 6. 'What portion of the river consists of pools, their length and average depth.'

"Answer. Of the 416 miles of river between Waco and Richmond 389.1 miles are pools. The Brazos River does not descend to the sea in a gradual slope. It is, as far as San Felipe, a series of elongated lakes or canals or pools, rising one above the other from San Felipe to Waco. These lakes or pools vary in length from one-fourth mile, the smallest, to 84 miles, the longest. Below San Felipe the lake system of the river is not so well defined, but sufficiently so as to class as pools, being uniformly deep water. The lakes are fed by perennial springs, terrestrial and subaqueous, as far as a point above San Felipe, and they are wholly independent of the supply of water from above Waco.

"These pools or lakes are forty-four in number between Waco and Richmond. Their length, seriatim, beginning at first from Waco, is as follows: (1) 5½ miles, (2) 3½ miles, (3) 6.4 miles, (4) 4.6 miles, (5) 6.4 miles, (6) 3½ miles, (7) one-fourth mile, (8) 5½ miles, (9) 9.6 miles, (10) 4.4 miles, (11) 3½ miles, (12) 1.8 miles, (13) 14 miles, (14) 12 miles, (15) 8½ miles, (16) 5½ miles, (17) one-half mile, (18) 2½ miles, (19) 1½ miles, (20) 4 miles, (21) 1.8 miles, (22) 5½ miles, (23) 3½ miles, (24) 1.7 miles, (25) 3½ miles, (26) 1½ miles, (27)

1¼ miles, (28) 2.3 miles, (29) 21.87 miles, (30) 4.65 miles, (31) 20 miles, (32) 5 miles, (33) 7.9 miles, (34) 14.6 miles, (35) 84 miles, (36) 7 miles, (37) 5½ miles, (38) 21 miles, (39) 11.6 miles, (40) 3½ miles, (41) 26½ miles, (42) 2 miles, (43) one-fourth mile, (44) 24½ miles, (45) 5 miles (unfinished beyond Richmond). These make 389.10 miles of pools, with 8.90 miles from the first clearly defined pool or mixed water.

"THE DEPTH OF THESE POOLS.

"Nearly all of these lakes have a well-defined and uniform channel through their entire length. The depth of these channels was thoroughly measured, each separately, the depths of which I have arranged. The average depth was 4 to 10 feet at time of measurement, with occasional 2 to 3 feet water over loose sand for a few yards at each end of the pool. Many pools are 20 to 40 feet in deepest places.

"'4. What portion of the stream is shoal and would require jetties to narrow, control, or make a channel?'

"As there are 44 lakes of deep water, there are 44 places which obstruct navigation. These are the steps over which these lakes discharge their surplus water into the lakes below. Of these 44 steps 36 are shoals. These shoals vary in length from 25 feet, the shortest, to 2 miles, the longest. Each would require from one to three jetties to narrow the river and form a channel.

"'5. The length of the rapids, the force of the current over them, and whether the boats could stem such a current?'

"Answer. The rapids are eight in number, of which seven occur between points on the river opposite Marlin and Hearne; the last is situated about 7 *miles* above Washington.

"The length of these rapids is respectively as follows, beginning from Waco end: Falls on the Brazos, 1¼ miles; Rock Rapids, 600 feet; Blue Shoal Rapids, 1¼ *miles*; Curley Rapids, 3,000 feet; Calvert Falls or Blacks Crossing, one-third mile; Herndon Falls, 4,400 feet; Port Sullivan Rapids, one-half mile, and Hidalgo Falls, 900 feet.

"The current over these rapids is so affected by various causes, such as *friction*, obstructions, etc., that it is various, even in the same rapid. Estimated from the declivity and the length of each, the current in none of them would be less than 6 to 8 miles per hour if run in an unobstructed channel.

"Boats could not stem the current of the rapids except by the use of capstan and hawser. To that method the current over the rapids would be no obstacle.

"No. 1. 'What obstructions to navigation, such as bridges, snags, fallen *timber*, falls, and rapids, exist in that part of said stream?'

"Bridges are 12 in number. Snags occur very rarely in the upper part of the river; in lower part more frequently. Between Washington and Richmond are 35 *groups of* snags, with occasional isolated single snags; in the upper part of the river, two-thirds of the entire length, about as many. Fallen timber offers no obstructions; falls and rapids are embraced in a previous answer.

* * * * * * *

"No. 8. 'What would be about the expense of removing existing obstructions and jettying the shoal portions of the stream?'

"From careful observations made, I estimate the expense as follows:

For removing snags and rocks in channels over the shoals	$100,000
For jetties over shoals and rapids, 80 jetties, at $1,000	80,000
For excavating channels in 8 rapids, $50,000 each	400,000
Total	580,000

* * * * * * *

"No. 2. 'The average depth of water in the stream at the several seasons of the year, as near as can be ascertained by inquiring?'"

"The water in the lake channels, which form almost the entire length of the river, is almost absolutely without variation below the measurements we found on the trip. The testimony to this from intelligent persons was unvarying. The flowing water of the river varies from a few inches over the shoals in the drought of summer to 25 feet in the spring floods. From the meager but best information attainable, the water should be from 3 to 25 feet over the shoals from October to July, which would make the river navigable for light-draft boats for nine months in the year from Waco to the mouth, except for the eight rapids, which could be crossed in not less than a 10-foot rise. This subject can be determined only by protracted observations.

"The above general replies are based on elaborate measurements and calculations.

"I may, perhaps, be allowed to close this report by a few suggestions purely gratuitous. The Brazos in respect to its long and deep-lake system is a remarkable river. It has 44 lakes, the channels of which constitute natural canals. The shoals and rapids, also 44 in number, fitted with locks and dams, should make slack-water navigation from Richmond to Waco possible every month in the year except in high water. The lakes and steps enumerated do not include the water from Waco for 9

miles down the river, but that piece of water is included in estimate for improvements. The study of the river was made at an excellent time, the river being nearly at its lowest. As a summary, the Brazos during our measurement contained, from Waco to Richmond, in round numbers, 398 miles of water practicable for light-draft boating and 16 miles of shoals and rapids."

The report, in addition to the above, gives a detailed report of the measurements of each reach and step, made with the care, if not the authority, of a Government official. Professor Hurwood's estimate of cost may be too low, but his measurements have stood the test of expert examination.

The data is submitted with the hope that in making your report upon the improvements at the mouth of the Brazos you will make favorable mention of the Brazos navigation as far as Waco.

S. L. JONES,
Secretary Waco Commercial Club.

Col. HENRY M. ROBERT,
Chairman Board of Engineers
for the Examination of the Mouth of the Brazos.

APPENDIX P.

RECEIVERSHIPS BRAZOS RIVER CHANNEL AND DOCK COMPANY.

George W. Angle and Frank Caldwell, September 5, 1890, to March 27, 1891.
George W. Angle and Gustav Wilke, March 28, 1891, to February 2, 1892.
George W. Angle, February 2, 1892, to March 25, 1896.

APPENDIX Q.

STENOGRAPHER'S REPORT OF A HEARING AT THE HOTEL VELASCO, VELASCO, TEX., JANUARY 11, 1897, BY THE BRAZOS RIVER BOARD.

Present: Col. H. M. Robert, Corps of Engineers; Mr. Stehman Forney, assistant Coast and Geodetic Survey; Mr. Robert Moore, civil engineer; Mr. Jay Stone, secretary and stenographer; Mr. L. L. Foster, manager Brazos River Channel and Dock Company; Col. Guy M. Bryan, of Quintana, Tex.; Mr. L. R. Bryan, banker and lawyer, of Velasco, Tex.; Mr. J. P. Bryan, of Quintana, Tex.; Col. Mordella Munson, of Oystercreek, Tex.; Mr. H. K. Davis, of Hearne, Tex.; Mr. J. L. Hudgins, of Velasco, Tex.; Mr. H. L. Brown; Capt. A. H. Ahm, captain of the light-house station at Velasco, Tex.; Mr. J. M. Moore, of Velasco, Tex.

Colonel ROBERT. This hearing is given by the Brazos River Board (which was appointed under the provisions of the act of Congress of June 3, 1896), at the personal request of citizens of this locality and other parts of Texas, and we would be very glad to listen to anything bearing upon the subject under investigation or matters having relation to it that any gentleman present desires to express.

Col. GUY M. BRYAN. Gentlemen: It will perhaps be interesting to you to know something of what has been thought in the past of the improvement of the mouth of the Brazos River. In the beginning J. F. Austin, the founder of Texas, thought that deep water could be obtained there, and directed the town of Quintana to be laid off there, in 1835, in view of these contemplated improvements. During the Republic of Texas some of the prominent men of Texas—the Whartons, Branch T. Archer, T. J. Green, and others—formed a company and laid off Old Velasco for the purpose of availing themselves of the advantages of the mouth when improved as contemplated.

In 1851–52, Senator Thomas J. Rusk, ex-Secretary of the Treasury, Robert J. Walker, and ex-Senator T. Butler King, of Georgia, came to Austin when the legislature was in session, to obtain a charter for a southern Pacific railroad through Texas. T. Butler King came to the mouth of the Brazos and, with the aid of the pilot of the place, thoroughly examined the bay and river and returned to Austin satisfied of the natural advantages, and with improvements, that deep water could be obtained, and that it was the point on the Gulf to make a terminal of the road. Years afterwards I met Mr. King in New York and he told me that eventually one of the largest cities of the United States would be built at the mouth of the Brazos; that it was the only river of its magnitude in the United States that emptied directly into the

Gulf with one mouth; that all the other rivers of its size emptied into bays or by several mouths.

Several of the wealthy stockholders of the International Railroad, viz, W. E. Dodge, Walter Phelps, Galusha A. Grow, Moses Taylor, and others, formed a company to improve the mouth, and in 1872 these gentlemen came from Houston to Columbia, where a steamboat was waiting for them. They came to the mouth and spent some time in examining it, and decided that in three months they would commence building jetties, and that they would make it the Gulf terminus of their road. But shortly afterwards a financial crisis spread over the country, and some difficulties arising with the settlement of railroad claims and differences arising among the directors of the international road induced them to abandon their project, but in the meantime they had bought thousands of acres of land on and near to the Brazos. I was one of the directors of this company, and was with them on their trip from Houston to the mouth, and know from conversation with them that they were entirely satisfied that deep water could be obtained at the mouth. It is a matter of great public interest that this country should be developed. If you go back into the interior a few miles you will find the richest country in the world. The valley of the Nile does not surpass it. It stretches from Oyster Creek across to the Colorado. The valley of the Brazos is exceedingly fertile and rich, and as you go into the interior it is well populated, has extensive towns and farms, and all their produce will come here.

All that country up there is interested in the development of the mouth of the Brazos. It is the nearest point for the Pacific Coast and for that immense territory which lies intermediate. The Northwestern States are now exceedingly interested in getting their grain off from the Gulf ports. The grain market has increased wonderfully at Galveston, and they have not the capacity to handle it. There is no hostile feeling toward Galveston, but Galveston is not adequate to handle the commerce. This country is settling up and the production will constantly increase, and we must have a vent for it by way of the Gulf. I need not say to you, gentlemen, that water transportation is so much cheaper than rail, and we have now to depend almost entirely on rail. All the products which now go by rail will go by water, because everybody wants to go where transportation is cheapest, and that is what will happen here if the Brazos is improved. I see that Waco has already had a meeting of its chamber of commerce and that it has appointed a committee to meet you. All the people in this surrounding country are largely interested in this matter.

I have been reared in this country, have lived here many years, and know thoroughly the peculiarities of the country. I have traversed it in childhood and in manhood over and over again, and everyone who is familiar with it will agree with me in what I have said as to its fertility. I would state in addition that one reason why all the people I have talked to and who are interested in the matter desire the Government to take charge of the improvement is that private companies are liable to financial vicissitudes, as has been evidenced in the case of the present company. There is not that reliance on private enterprise as in the efforts of the United States Government. Private companies may come and go, but the United States go on forever, and if it is a worthy enterprise the Government completes the work. That is the reason why confidence will be insured if the Government takes charge of the work.

Mr. CORTHELL. I think that you are familiar with the circumstances attending the surveys made by Captain Howell.

Mr. BRYAN. The Secretary of War, in answer to a request of this company, that was interested in the development of the mouth of the Brazos, so as to make it a terminus for the international route, gave an order to Mr. Howell, who was the engineer of the Louisiana and Texas coast, to make a survey at the mouth of the Brazos and state the practicability of improving it. He was directed to give details. When he came down with those gentlemen from Houston to examine the mouth of the Brazos, Mr. Grow, who was with them, presented to the gentlemen who were on board of the train the report of Mr. Howell, which contained a map of the mouth of the river. He stated that he had had experienced men to make the survey, and they reported strongly in favor of the survey, reporting, also, that it could be done at comparatively little expense, provided that the information he had obtained as to the procurement of material was correct. This report was spread out and we all looked at the map, and it was a subject of great interest to us, because it was made at the instance of the Secretary of War and Mr. Howell was the Government officer who was charged with making important surveys.

Colonel ROBERT. Do you recollect the depth of water that was obtained?

Mr. BRYAN. No, sir; I do not recollect what that specified. Mr. Howell reported that they could get good water, but I do not recollect whether he stated how much; but he stated that by building jetties it could be accomplished sufficient for all commercial purposes. His headquarters was in New Orleans.

Colonel MUNSON. There is very little I can say in addition to what my friend, Mr. Bryan, has said in reference to the action of these gentlemen who were charged with the work in making the surveys, except that I am perfectly satisfied that the Brazos is the great river of Texas. I am satisfied that practical work can be done, and that commerce can be brought to the mouth of the Brazos from the interior. I have personally examined it, not as an engineer, but for my own information. The falls of the Brazos is the great obstruction, to begin with. I can not understand or explain why this phenomena presents itself, but I have twice gone over the ground to learn about those falls. I have examined the river up to Waco, for my own satisfaction. I do not understand what peculiarity brings about this change at the falls, but to me it is a great curiosity. Just at the edge of the prairie at the falls there appears to have been at some time a great convulsion. Great rocks are piled up there to the westward. Sitting on my horse at the bottom of the falls and looking up, the incline was in that direction [pointing], and toward the east there is a deep and dry valley from the edge of the prairie for 5 or 6 miles that was the bed at some time of a deep river. The public road runs out at the edge of it.

In the bed of that river I saw immense trees growing, and riding along that margin you are just on the edge of the tops of those trees. Along the edge of that prairie I am satisfied that an active man with a spade could have turned the water from its present bed of the Brazos River into this old channel. It was but a step or two from the old channel to where it terminated there. There is the finest location there for manufacturing places that I ever saw. The old bed is wide and deep, but I have no idea what the convulsion could be that brought about this great change. You get to the foot of it, and sitting on your horse looking up you see great bowlders piled one upon another. Very little work will turn the river back into its old bed. For manufacturing purposes or anything of that kind, it is the finest water power in the world. This was the only obstruction that we saw. After you have reached the foot of the falls you will find that it is not low water. I can scarcely find anything to express adequately to your mind the condition of things. The bed of the river seems to be a succession of bowlders. Sometimes there would be 8 or 10 feet of water, and at others the water would just cover the rocks. I think that a man understanding anything about dynamite could blast out the whole of it in a short while. I have no doubt that with a little money it would be the great water course of the United States. You could improve to Waco easily, and the only obstruction is the falls, and that could be removed, I believe, with a little skill and money. It is the river of Texas. There is no mistake about it. I speak of my own motion and from my own observation. The examination was made to satisfy myself, but not as an engineer.

Colonel ROBERT. Do you know how far those falls are up the river?

Colonel MUNSON. I don't know, sir; it was a very dry season when I came down.

Colonel ROBERT. Have you any idea how far to the falls it is from the mouth of the river?

Colonel MUNSON. I can not tell the distance.

Colonel ROBERT. Can you give any idea about where they are located?

Colonel MUNSON. Just below the little town of Marlin.

Mr. BRYAN. Colonel Munson's remarks about the river remind me of a circumstance. After the passage of the Santa Fe indemnifying act, when the United States gave Texas $10,000,000 for our claim to Santa Fe east of the Rio Grande, the Texas legislature appropriated some of the money for improving the rivers, the Brazos among others. The county judge of Fort Bend County, Judge Cook, and myself made an effort to get an appropriation from the legislature for the Brazos River. We had a couple of men and took a skiff from Richmond, which is on the river in the county just above this. We sounded the river at every bar from Richmond down to tide water. It was, as Colonel Munson says, a succession of falls, and then it would be a bar. It was very deep at times and then there would be obstructions caused by driftwood. There were snags in the river, and the débris floating down the river would catch around them and make a bar.

Mr. CORTHELL. I would like to ask Colonel Munson or Mr. Bryan to give a history of the navigation of the Brazos River up to the falls, or any incident that they are familiar with connected with that matter.

Mr. BRYAN. There were two boats that ran regularly up the Brazos as far as Washington called the *Brazos* and the *Washington*. That was in 1848, 1849, and 1851. One year they made trips regularly to Washington.

Mr. MOORE. Is Washington below the falls?

Mr. BRYAN. Yes, sir; it was the seat of government when I came to Texas. It is about 250 miles from the mouth of the river.

Mr. CORTHELL. Are you familiar with the fact that captains and masters of vessels used the mouth of the Brazos and the Gulf there as a harbor of refuge and anchorage grounds?

Mr. BRYAN. In the days of the Texan republic a French fleet came up there and

anchored at the mouth of the river and communicated with the governor of the city. The commander said that it was the best anchorage that he found in the Gulf of Mexico. That is authentic, as it is an incident which I recollect. It is historical.

Mr. MOORE. What year was that?

Mr. BRYAN. I don't recollect; but it was in the days of the republic.

Colonel MUNSON. France had a little fleet on this coast when I was a small boy. My parents had a summer home at the mouth of the Brazos. The Frenchmen would very often come ashore. The commander, as I remember him, was a very convivial, cordial gentleman, and he was very kind to the early settlers here. I was present on one occasion and heard him remark to a number of gentlemen that the Gulf near here was the best holding ground off the coast of Texas, and that it was the best he ever saw. He made the remark that he rode in a hurricane there; that a ship would part its cable, but that it would never drag its anchor. The solution was that the bottom was of soft mud and holds the anchor.

Mr. FOSTER. I have heard it said that a great many coaster vessels were lost on the coast of Texas prior to the opening of this bar, and that since then it has been a harbor of refuge for all vessels that ply along the coast.

Mr. BRYAN. When Colonel Giddings was in Congress there was a petition sent to Congress to clean out the Brazos on account of its being a harbor of refuge for coasting vessels. When they leave Galveston going westward, and coming eastward from the west of this place, there is no safe place for them to enter. Pass Cavallo, the entrance into Matagorda Bay, is unsafe to enter, and it is the same with Aransas. I live at Quintana, at the mouth of the Brazos, and a great many of these coasters come in there when the weather is threatening, for the purpose of refuge. They come in and stay until the weather changes, and then go out. Particularly is this the case of vessels going westward from Galveston. As a place of refuge alone it is a very important matter, and if there is deep water all the naval and other vessels can come in there. You can see for yourself what the mouth of the river is. You can see that it is landlocked and would be a perfectly safe harbor. In fact, if we can get deep water, it is the safest harbor on the Texas coast. I met a friend in Houston whom I knew before the war. He was a banker in New York. He made a great deal of money here, and has made a great deal more since in New York. His name is Swinson. He asked me what we were doing at the mouth of the Brazos, and when I told him, he said that that was the place for a large town. He told me that he crosses the Atlantic frequently, and has become intimately acquainted with a captain of one of the ships. In conversation he spoke of the Brazos' mouth, and found that the captain knew more of it than he did. The captain said that it was the best port on the Gulf.

Mr. J. L. HUDGINS. I don't know that I could say anything to advantage, but I have been here a long time and have watched the progress at the mouth of the river for the last fifty years. We always did a great deal of shipping until after the Brazos Canal was cut, and after that the water shoaled up on the Brazos Bar. I came in on 11 feet of water once. It stayed so until the war. During the war these passes were blocked, but the blockade runners came here within twelve days of that time. I went down there myself and helped to block the river with live-oak timber.

A VOICE. Did the putting in of this live oak have any effect on the bar?

Mr. HUDGINS. I think myself that this timber should be removed from there. It was put in to stop the Federals at the time of the war. The principal point where it was put in is 2 miles above here. We whipped the Yankees with it, anyhow. I have always known that whenever they wanted to improve this place all they would have to do was to put jetties out and they could have deep water. The Brazos River needs cleaning out from here to Columbia. There are some bad spots there, and it is caused by driftwood getting into the bottom. I can not say anything of the river in the way of science, but speak only from my own experience. I have no education and deal only with common sense. The canal here was dug to get the sugar out of this country.

Colonel ROBERT. When was that canal made?

Mr. HUDGINS. That canal was commenced in 1851 and finished in 1855.

Colonel ROBERT. How much water did they have there?

Mr. HUDGINS. We left 4 feet. During the war there were no boats running and there was no navigation for about five years. The trouble is, you can not get the banks to hold; they cave in and the result is the river fills up with mud.

Mr. CORTHELL. Were those live oaks that were put in there brought up to the surface of the river?

Mr. HUDGINS. They were sunk as fast as we put them in.

Mr. CORTHELL. Did you bring any troops up there?

Mr. HUDGINS. No, sir.

Colonel MUNSON. My brother had charge of the party that made the dam there and he has told me repeatedly that for about 60 feet he could not fill in the river, because the current was so strong. Above that the water was in such shape that

vessels could pass. He said that there was a space there where the current was so strong that the logs would be washed away and brought up to the surface. The current is very strong and concentrated at that point.

Colonel ROBERT. Were those logs driven in as piles?

Mr. HUDGINS. No, sir; they just rolled them in, and they were so heavy that they sunk.

A VOICE. I was there at the time the dam was built, and the current left an opening of 30 to 50 feet.

Colonel ROBERT. Is there any gentleman present here who has any views that he would like to present to the Board bearing on the subject of the improvement at the mouth of the Brazos River? If so, we would be glad to hear him.

Mr. BROWN. I live up in the interior of the State, in the cotton belt. What we want is cheap shipping for our cotton. I was told by Colonel Giddings that if this improvement was a success we would be able to have our cotton taken for $1.25 a bale cheaper than by shipping it to Galveston. Our business is to raise cotton and cotton-seed products. We only raise enough breadstuffs for our living. We want some return for our crops if we can get it. I have been here at times, and have talked with captains of vessels, and they told me that they could go to sea from here at from $600 to $800 less a cargo than from New Orleans. The charges were so much less. It would be a great benefit to the agricultural interests of the State if we had an outlet for our products independent of Galveston. The wharf company there is a great monopoly. I live near Washington, in the cotton belt, between the Brazos and the Colorado.

Colonel ROBERT. Do you expect to get your cotton away from here by railroad?

Mr. BROWN. Yes, sir; there are plenty of railroads pointing this way. All they want to know is that this improvement is going to be made a success. There will be no question as to getting roads.

Mr. FOSTER. A question has been raised here with reference to the ownership of the water frontage, and Colonel Robert wanted some light on the subject as to whether or not the same condition which is now found at Galveston would be found in any case of the improvement. You know the fact that under the recent compromise, the town of Quintana owns part of the frontage.

Mr. BRYAN (L. R.). I think the syndicate claims all the frontage elsewhere, but by decree recently given by the court, which is now in session at the county seat, the people of Quintana own the frontage there.

Mr. ROBERT MOORE. How long a frontage is that?

Mr. BRYAN (L. R.). I suppose it is as far as from our town to the river there [pointing], about 1,000 feet on the east side. Then there is another front there which is about 2,000 feet long. Just above that there is another tract of about 4,000 or 5,000 feet that is not owned by the syndicate. Above the mouth of the bayou there is about 6,000 feet not owned by the syndicate.

Colonel ROBERT. Mr. Moore, you are treasurer of the Brazos River Channel and Dock Company, I believe?

Mr. J. M. MOORE. Yes, sir.

Colonel ROBERT. Is this syndicate that owns the land here the same that owns this water frontage?

Mr. MOORE. It is virtually the same company. The Brazos River Channel and Dock Company owns the front. In point of fact, the Brazos River Channel and Dock Company, the Texas Land and Immigration Company, and the Velasco Terminal Railway Company are, as I understand it, of one interest.

Colonel ROBERT. I wanted to know whether these interests are all identical, and whether the company which wants to sell these improvements are also the landed interest.

Mr. J. M. MOORE. I presume that it is.

Mr. BRYAN (J. P.). I know that the surveys are made separate. The Brazos River Channel and Dock Company only runs back 300 feet, but back of that is the Texas Land and Immigration Company. I own some of the land around here and I know that the frontage on the river is separate and distinct from the back land.

Mr. J. M. MOORE. They are different companies, but in point of fact, they are the same interest.

Mr. BROWN. They claim this frontage under an act of Congress, which is to be a matter of litigation.

Mr. BRYAN (J. P.). I think you are mistaken. This land is claimed under an act of the legislature for the benefit of Aransas Pass, and under its charter they claim the right to condemn where it is arable 150 feet and where it is not arable 300 feet, and in consequence of that they have laid off 300 feet separate from the other.

Mr. BRYAN (L. R.). I am not interested in the company, but I am a citizen of Velasco and president of the bank in which Mr. Moore is the cashier. All these interests are practically one. As I understand it, all that the Brazos River Channel

and Dock Company own was procured by them by purchase before they commenced this work. They claim the right to condemn, but they have never undertaken to condemn anything, whether they have the right or not. They have some of the frontage, but there are other frontages there that are owned by private parties. I own some of it myself. There is nothing here whereby they can exercise a monopoly. I think that this being a cotton port it is necessary to bring about competition and that this company can afford to give wharfage and other facilities and they can all afford to make concessions. It is to our interest to build up this community. The company owns large landed interests here and it is to their interests to afford facilities in order to develop the harbor. The opening up of the Brazos River to the commerce of the country is the important point to be considered. I got up a pamphlet which was addressed to the people of the Brazos Valley and the Velasco Board of Trade which goes into the history of this thing and contains an estimate of the cost of improving the river by Mr. G. Y. Wisner, civil engineer of Detroit, Mich., and also several reports on the river by professional men. It also contains a report of a survey made by Mr. R. B. Talfor, the United States assistant engineer at Galveston, in 1875.

These reports were made at my instance, and embrace an estimate of the cost of opening the channel from Waco to the mouth of the river for 4 feet of water. Recognizing the fact that in a new State like ours people had an erroneous idea of the cost of improving the Brazos River, I addressed a letter to Mr. Wisner with a report upon the subject by Professor Harwood, of the Waco Board of Trade, and I also made a copy of the survey which was made under the direction of one of your Boards of Engineers in 1884 or 1885, and requested Mr. Wisner to state in a practical way what would be the cost of opening up the channel from Waco to the mouth for 4 feet of water. He replied that there was such a wide discrepancy between the two reports that it was hard to arrive at a just estimate. He said that if Captain Talfor's survey was correct it would cost $2,500,000, and that if Professor Harwood's survey was correct, it would cost $2,000,000. The people thought that it would cost from ten to fifty millions to make the Brazos navigable to Waco. The impression is that there is from 400 to 500 miles of river to improve. You will find in that pamphlet, of which I spoke, that there was over 300,000 bales of cotton raised in the counties fronting on the Brazos River in 1891.

If you will take the map of Texas it will be seen by anyone familiar with the general physical characteristics of the State that the State is divided into three belts. The eastern belt is the timber belt, the central the agricultural belt, and the western part the grazing belt. The Brazos River runs through the center of the agricultural belt, and it runs through the black-land counties of Texas, which are famous for the production of cotton and sugar. The crops of cotton are enormous and the sugar crops are so great that that particular section is known as the "sugar bowl" of the United States. Mr. Foster, I believe, has the statistics which will give you an idea of the fertility of this valley; and this section will be enormously increased in value if we can get 4 feet of water from Waco to the mouth of the river. If we can have at least that depth the river will be navigable to vessels that will carry at least 500 bales of cotton each. I have seen vessels loaded with 800 or 1,000 bales of cotton that only draw 2½ feet of water. They used to take rafts on the Ohio River and come down the Mississippi River with them to New Orleans, and I do not see why we can not do the same thing.

Mr. FOSTER. Is not the ownership of this land pretty well disseminated?

Mr. BRYAN (L. R.). The land is pretty well distributed around here and is owned by various parties in the State. These gentlemen here will have no monopoly of the general benefits which will accrue, and they do not own all the stocks and bonds of the company. The benefit will come, as has been stated by Colonel Bryan, when the question of the improvement is taken out of the hands of the private corporation and placed under the control of the Government, so that all the different interests will share in the development. There are many gentlemen present here to-day who live at a distance but who are much interested in this matter. They have no interest in this company here. It has just been said to me by a gentleman of the State, that in four counties, Brazoria, Fort Bend, Matagorda, and Marion, we have what is called the "sugar bowl" of Texas, producing enormous crops of sugar, besides cotton and other products. Before the war they contained the great bulk of the wealth of the State. Since then they have not had the facilities for commerce, nor proper rail nor water transportation, and we had no increase in population here until this enterprise was opened up. We believe that with the opening of this port that this part will be what it was once before, the garden spot and the richest part of the State.

Colonel ROBERT. You spoke of the falls in the Brazos River. Does anyone know their height?

Mr. BRYAN (L. R.). You will find about that in the pamphlet of which I spoke.

Colonel ROBERT. Are they 30 or 40 feet?

Mr. MUNSON. No, sir; just a few feet.

Colonel ROBERT. What is your idea of the difference of level of those falls? Is it a question of 20 or 30 or 60 or 80 feet? Can you give us some idea?

Mr. MUNSON. I could not with any certainty, but I am satisfied that there is not a very great difference of level.

Mr. DAVIS. Speaking of boats navigating the river, I have lived at Hearne fifteen years. I understand that boats used to navigate 5 or 6 miles above there. Speaking in regard to railroads coming in here, there is an uncertainty with regard to private parties having control of the improvements, and as to their being able to maintain them, and we feel that the only way to have a substantial enterprise is by the Government taking charge. Several railroads have already been projected, and the competitive point for all of them is the mouth of the Brazos River. All the cotton resources up our way look to this point here as the outlet for their products. One of these roads is the Fort Davis, Hearne and Brazos Railroad; another is the San Antonio and Gulf Shore Railroad. The Rock Island Railroad will compete for the business of the Brazos Valley. This is the great cotton country. All the new railroads which originate in this county have this place for their objective point. I have been up to Waco and the people there think that it is feasible to make the river navigable from Waco to the mouth.

Mr. FOSTER. As you are familiar with the railroad rates, I would ask what would be your opinion on this subject of rates throughout the entire State of Texas should the Brazos be opened to navigation?

Mr. DAVIS. I should think it would at least lessen the rates to the extent that has been stated here. If it would a dollar and a quarter on a bale of cotton, it would lessen the cost of marketing it to an enormous figure in favor of the producer.

Mr. FOSTER. Would not the opening of the Brazos have a modifying effect on all rates within 100 miles on either side of the river?

Mr. DAVIS. Yes, sir.

Mr. FOSTER. Would that benefit be confined to the Brazos River?

Mr. DAVIS. No, sir; it would affect other parts of the State.

Colonel ROBERT. Are there any other gentlemen here from this vicinity or elsewhere on the river valley that would like to say something? If so, we will be glad to hear them.

Mr. DAVIS. Everybody up our way is interested in Velasco. They think that this port will be eventually opened, but they have waited so long that they got the "blues." But they think that if the Government will take hold of it, it will certainly be a success.

Mr. BRYAN. Several of the leading roads of the State sent their representative man here to examine the mouth of the Brazos. They are desirous of coming here, but just as Captain Davis says, there was a want of confidence in the private corporation. The "International," the "Katy," and another route sent their representatives here to examine into the practicability of getting deep water. The company would do it, but they were not satisfied with having the improvements under private ownership. My belief is that if the Government would take hold all the great roads of the State would make terminals here.

Mr. DAVIS. They are pointing this way, but they are watching to see if the development will be made before they go to the enormous expense involved. The reducing of transportation rates would make an enormous addition to the wealth of our producers. There were over 3,000,000 bales of cotton raised last year and the difference in rates would make a saving of something like $7,000,000.

Mr. FOSTER. Do you refer to the whole crop of Texas?

Mr. DAVIS. I mean between the radius of 100 miles of the river—central Texas, through which the Brazos runs, and which is the cotton belt.

Mr. FOSTER. You maintain that this reduction in rates on cotton that comes by way of Velasco would affect the whole cotton crop of the State, including that which goes by the way of Galveston as well?

Mr. DAVIS. Yes, sir; because it would be competitive against Galveston. I don't think it would all come this way, but the competition would affect the rates elsewhere.

Mr. BRYAN (L. R.). Captain Ahm, of the life-saving station, says that prior to the improvements at the mouth of the Brazos River the wrecks were two or three in a month, and since then there have been only two or three a year.

Captain AHM. I am captain of the life-saving station here. Prior to the building of the jetties here wrecks were very frequent. Since then they have been reduced, so that where we formerly had four or five we have one now, perhaps even less. Before the improvement the harbor was a hard one, but now it is quite different. Unless there is mismanagement a vessel can now come safely into the river.

Colonel ROBERT. How many wrecks do you think there would be in a year?

Captain AHM. About a dozen a year. During the years 1888 and 1889 there were more than a dozen.

Mr. ROBERT MOORE. In the case of these wrecks, what caused their failure to enter the harbor?

Captain AHM. Before this work had been started the channel would change, and there would always be uncertainty of water over the bar.

Colonel ROBERT. These wrecks are not from passing vessels?

Captain AHM. They were from vessels taking refuge here or vessels coming in here.

The hearing was then adjourned.

APPENDIX R.

LETTER OF PRESIDENT OF BRAZOS RIVER CHANNEL AND DOCK COMPANY.

WASHINGTON, D. C., *February 15, 1877.*

SIR: By direction of the executive committee of the Brazos River Channel and Dock Company I make the following additional statement to the Board concerning the ownership by this company of property upon the banks of the Brazos River.

If our right to charge tolls as provided by the act of Congress should be taken from us by the United States exercising its option of taking over our jetties and auxiliary works, we should be unable to establish a monopoly at the mouth of the Brazos River similar to that existing at Galveston even were we inclined so to do.

First. Because our charter is obtained from the State of Texas whose laws provide that "all rate, tolls, or charges made by any corporation formed under this act (the act to establish channel and dock companies) shall be subject to the right of the legislature from time to time to alter, revise, change, or amend," whereas the Galveston Wharf Company is not so subject to the control of the Texas legislature or other authority.

Second. Because we have no exclusive ownership of the water front at the Brazos River (see map heretofore submitted) whereas the Galveston Wharf Company owns the entire water front at Galveston as we are informed.

Third. Because the establishment of unreasonable tolls would restrict that commerce which is absolutely necessary for the success of the port.

Inasmuch, however, as it has been suggested that at some time we or our successors might attempt thus to establish a monopoly and to exact unreasonable charges, we announce our willingness to accept the following conditions of any purchase or taking over of our jetties and auxiliary works by the Government:

First. That 1 mile of land upon the water front, 300 feet in width on the east side of the Brazos River, within 6 miles of the shore end of the east jetty, shall be conveyed to the United States or to the State of Texas or to the county of Brazoria or to the city or town which may be incorporated, embracing the present town of Velasco for the purpose of the construction of public wharves and docks, which shall be free to the general public for all time, or, at the option of such public owner, a portion of said land not exceeding one-half thereof may be located upon the west side of the river within 6 miles of the shore end of the west jetty, said land to be subject only to the right of laying railroad tracks upon a strip 50 feet in width farthest removed from the Brazos River; or this company will indemnify and save harmless such public owner from any expense of taking said land by the right of eminent domain.

Second. That the United States Government may make such further regulation as to wharfage dues as it may deem necessary.

Respectfully,

ABNER TAYLOR,
President Brazos River Channel and Dock Company.

COL. HENRY M. ROBERT,
Chairman of Brazos River Board, Washington, D. C.

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